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SLOWLY TOWARDS THE STARS

MAN-MADE satellites and mice-manned rockets are now sufficiently familiar to the public for neither to cause much comment either in conversation or in the Press. Indeed we doubt whether most people have any idea at all of the number of man-made satellites now regularly circumscribing the Earth. Soon, no doubt, the number will be so increased that their launching will become a matter for international discussion if not control.

So far as this country is concerned the production of what is known in technical jargon as "hardware" has hardly begun. Nor is the Commonwealth playing a serious part. It seems to have been tacitly assumed that the effort entailed is too expensive for us, so it has to be left to the Americans and Russians. It was consequently encouraging to see that the *Sunday Express* went out of its way to remind its readers last week that both Americans and Russians had cause to be thankful for the British initiative in putting up the giant radio-telescope at Jodrell Bank, which had proved extremely useful to both countries in tracking their satellites. Moreover, the *Sunday Express* went further and deplored, as we have so often done, the lack of leadership which has resulted in this country being so far behind in the business of rocketry.

Towards the end of August, on the 23rd of that month to be precise, the IX Annual Congress of the Astronautical Federation is taking place in Amsterdam. Out of the 58 lecturers four are from this country. There seem to be none from the Commonwealth. By way of contrast the wealth of talent from European countries and from the United States is overwhelming.

It is something to be thankful for that we have the British Interplanetary Society to represent our British enthusiasts in this field. They are sponsoring a party of some 20 members from their society, as well as some scientists from the Government departments.

Every year attendance at the Congress increases. This year nearly five hundred people are expected at Amsterdam, a considerable increase over the figure at Barcelona last year. Next year the Congress is to be held in the United Kingdom and will be organized by the B.I.S. The year after will be Sweden's turn. Then it is to be in the United States and after that Moscow.

In some ways it is a pity that the IXth Congress could not have been held in England this year, for in a few months' time, on October 17, the British Interplanetary Society will celebrate its twenty-fifth birthday. So it has certainly attained the stature necessary to organize an international conference. Instead, the quarter-century of the B.I.S. is to be marked by a Space Medicine Symposium held in London on October 16-17.

No doubt there are thousands of people engaged in the business of aeronautics who even now regard the idea of interplanetary travel or exploration as remote as the fantasies of Jules Verne seemed to their grandparents. But, as we began by pointing out, man-made satellites have been circling the earth for quite a while. At any time now we must expect the news from Russia, or from the United States, that the first attack on the Moon has been launched. This is expected to take the form of a sounding rocket which will attain "escape velocity" and so approach sufficiently near the Moon to get pulled into orbit of that luminary. It is expected that after travelling round the far side of the Moon, the sounding rocket will return to circle the Earth.

We are thus living in the first stages of the exploration of space as opposed to exploring the upper atmosphere. Unfortunately there are no signs whatever that this country, which has pioneered so many developments of human activity, is even contemplating participation in the new exploration. We must be thankful that the British Interplanetary Society is getting ready to bring so many internationally known leaders in the field of astronautics to the United Kingdom next year.

It should be known that there are close links between the men who are doing the work in other countries and our own scientists. For example, in this issue of THE AEROPLANE we have something to say about the appointment of Dr. Hugh Dryden as administrator of the new body which has been formed in the United States. This is the National Aeronautics and Space Administration (N.A.S.A. for short) and it is to absorb N.A.C.A. so widely known to all of us.

On various occasions we have drawn attention to the limited field of activity of our Aeronautical Research Council and we have yet to hear of any extension of its activities into extra-territorial space. One might have thought that in this year of international geophysics we might have heard rather more about the exploration of at least the outer atmosphere with sounding rockets of the simpler sort such as we have built in this country. Instead, the I.G.Y. activity which has received most publicity in Great Britain has been the trek across the South Polar ice. However notable and praiseworthy this undertaking, which it undoubtedly was, it will not have done much to direct the eyes of the younger generation to the stars. And that is where, outwards and onwards, the young people of the United States and Russia are looking.

B

MATTERS OF MOMENT

"Exploring" the Soviet Union

NOT its weight (38½ lb.) but its orbit is the most significant feature of Explorer IV, the latest satellite to be launched by the U.S. Army from Cape Canaveral. The plane of the orbit is sharply inclined to the equator and therefore carries the satellite over the Soviet Union.

An improved type of solid propellent is said to have been used for the first time in the last three stages of the Jupiter-C rocket, making possible an increase of the payload by 8 lb. It is assumed this means that the specific impulse of the propellent has been raised from about 220 to 280 sec. by the use of metallic additives, resulting in partial exothermic reaction and a hotter-burning motor. The Americans are known to have been striving along these lines for some time.

Previous U.S. satellites have all been launched South-eastwards along the track of the Florida Guided Missile Range, which intersects the equator at an angle of 35°-40°. In consequence, the highest latitudes that their satellites could be seen directly overhead were 35°-40° North and South. To cross the territory of the Soviet Union the inclination of the orbit to the equator had to lie between 60° and 70°.

By launching North-eastwards from Cape Canaveral at 60°, the rocket stages would fly over the open sea, parallel to the coast of North America, where they could readily be tracked, until the satellite passed over Nova Scotia and Newfoundland. A more northerly heading (70°) would have taken Explorer IV straight over New York, Southern Greenland and Iceland.

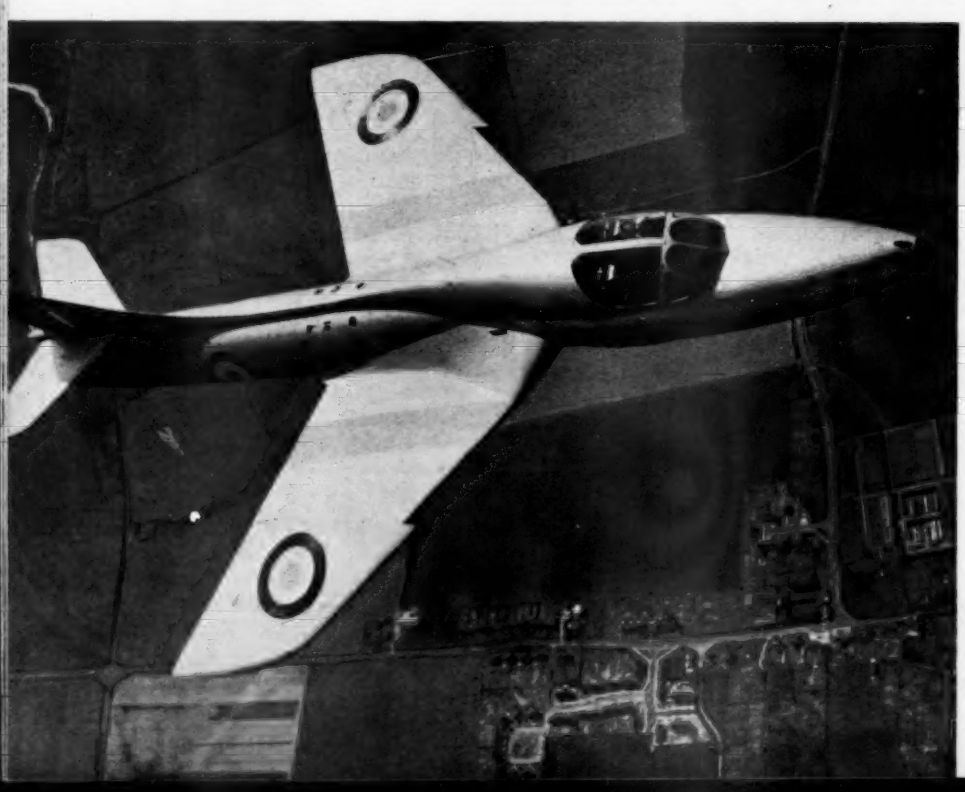
It is therefore probable that on its first circuit of the Earth the satellite passed over the Orkneys, which may account for the U.S. activity reported at Jodrell Bank a few days earlier. The giant 250-ft. radio-telescope, with its 4,000-mile range, happened to be ideally sited for radar-locating Explorer IV during its first, second, third and fourth revolutions. Its perigee and apogee are 1,750 miles above the Earth.

Presumably Explorer IV's instrumentation is similar to that carried in previous satellites, and will certainly include a miniature tape-recorder for playing back geophysical data when challenged by a ground-command station. The value of tape-recorded data, as an alternative to continuous signal transmission, is amply demonstrated by the sad state in which the Russians find they are in. Despite Sputnik III's vast size and heavy equipment (2,133 lb.) it carries no tape-recorder, and 97% of its transmissions are being lost.

It must be admitted that the latest U.S. attempt at a highly inclined orbit possesses some military significance and propaganda value, though its aim is mainly to acquire scientific data at high Earth latitudes. Preparations for sending up Pied Piper, the photo-reconnaissance satellite that will carry a crude form of television camera, and perhaps attitude control, must now be well advanced. A satellite that is argus-eyed is of little use if it does not cross the territory of potential enemies, and for weather-observing its orbit should be circum-polar. The Americans may have concluded that it would be wise to begin launchings in various directions.—I. G. WHY.

Photograph copyright "The Aeroplane"

SUMMER CAMP.—Members of the Glasgow University Air Squadron are now enjoying their Summer Camp at R.A.F. Thorney Island. Here with some of the cadets are, left, Gp. Capt. H. E. C. Boxer, O.B.E., A.D.C., the Station Commander, and Gp. Capt. T. S. Rivett-Carnac, D.S.O., D.F.C.



SERVICE TWO-SEATER.—A new picture of the Hawker Hunter T.7, which is powered by a Rolls-Royce Avon turbojet and is in service with the R.A.F. Another picture of this new Service two-seater is on page 166.

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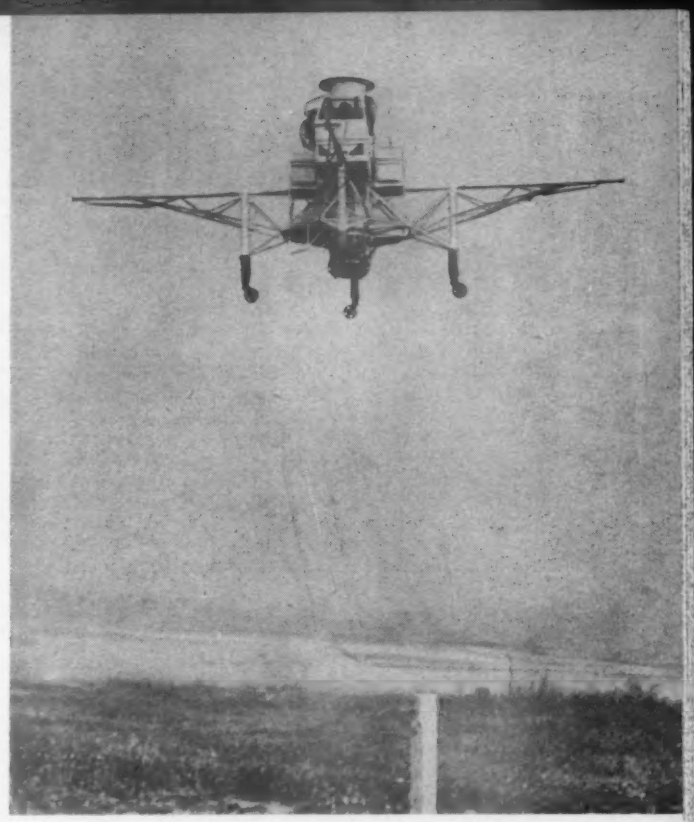


TUSHINO TAKE-OFF.—The Russian Turbolet VTOL aircraft at the recent Moscow air display attended by about a quarter of a million people. Main attractions were sailplanes, helicopters and trainers. The Tu-104 and the Tu-114 commercial aircraft (but no military designs) were also shown.

That Two-headed Bird

QUESTIONS about the erection of the proposed memorial to the double crossing of the North Atlantic by the R.34 airship in 1919 were asked in the House on July 23. Replying to Mr. Beswick (Lab., Uxbridge), Mr. Airey Neave, Parliamentary Secretary, M.T.C.A., said that the Minister did not wish to set himself up as a critic of modern sculpture and took the advice of the Royal Fine Art Commission.

A letter from the Master of G.A.P.A.N. appeared in *The Daily Telegraph* for July 26. Sir Frederick Tymms flatly stated that "this monstrous proposal is an outrage" to the memories of the men who flew in the airship and of those who built it.

What is remarkable during the present controversy is the silence of the Council of the Air League and of those members who have contributed to the cost of the proposed memorial. It seems odd that there has not been a chorus of supporting voices from the body which has voted so much money (£700, we believe) to work on the memorial to date.

None of those supporting the proposed memorial have done so on grounds of its suitability; they have been concerned only to speak in praise of it as a work of art. This seems strange, for the essential purpose of a memorial is that it shall recall to memory. And how what Mr. Gresham Cooke, speaking in the House, called a "horrible two-headed bat" so stridently made of gypsum and iron, can do this, we do not pretend to understand. The R.34 was a buoyant streamlined structure that floated in air.

A Man-powered Helicopter?

FOR this year's Cierva Memorial Competition the Helicopter Association of Gt. Britain have offered a prize of £50 for the best paper on the subject: "Is Man-powered Rotating-wing Flight a Future Possibility?" The competition, which closes on December 31, 1958, is open without restriction to entrants of any age and any nationality. It must be written in English.

So far nobody in this country has offered any prizes for man-powered aircraft with fixed or flapping wings. Nevertheless, in spite of this lack of encouragement, various enthusiasts are at work. In addition, a body has been in existence to co-ordinate such activities in this country for some time now. It has yet to offer prizes for essays.

Engines in the News

ANY new aero-engine developments by Rolls-Royce are of great interest, and there have been several recently in addition to the announced 1,000-hr. A.R.B.-approved overhaul life of the Avon R.A.29 civil turbojet (THE AEROPLANE, July 25).

Confirmation has been made of the choice of Conway by-pass turbojets to power the Douglas DC-8s of Alitalia, an order worth about £2¼ million, including spares. New thrust figures for the Conway have been released, the most powerful being the civil R.Co.15 of 18,500-lb. guaranteed minimum thrust (see page 162). Mention has been made of the R.B.142, a military version of the R.B.141 civil by-pass engine designed for the D.H.121 transport.

Most powerful of the civil Avon series is the R.A.29/5 of 13,300-lb. thrust, another variant being the 11,700-lb. thrust R.A.29/3. Previously the most powerful Avon was the military R.A.24 of 11,250-lb. thrust.

A new version of the Tyne twin-spool turboprop is the R.Ty.12 of 5,090 (guaranteed minimum) s.h.p. and 1,075-lb. thrust. This is presumably the engine for the Canadair CL-44, originally to have had the since-cancelled Bristol Orion. The Tyne R.Ty.12 will have air-cooled turbine blades.

A thrust may now be published for the R.B.108 VTOL turbojet, of which five are used in the Short SC.1. The type-test rating for this engine is 2,010 lb.

AIRBORNE NEWCOMER.—The Saunders-Roe P.531 helicopter airborne at Eastleigh on its first flight on July 20. It was piloted by Mr. Ken Reed, recently appointed chief helicopter test pilot.

The U.S.A. and World Records

THREE important aviation records, in addition to the World's air speed record referred to last week, have now been officially confirmed by the F.A.I. All are held by the U.S.A. They are:—

The aeroplane height record set up by Lieut. Cdr. G. C. Watkins, U.S.N., on April 18, flying a Grumman F11F-1F Tiger (General Electric J79-GE-3A turbojet of 15,000-lb. thrust) at Edwards, Calif.: *23,449 m. (76,932 ft.)*;

The aeroplane height record superseding the above, set up by Maj. H. C. Johnson, U.S.A.F., in a Lockheed F-104A Starfighter (G.E. YJ79-GE-7 turbojet of 15,000-lb. thrust) on May 7: *27,811 m. (91,244 ft.)*; and

The distance record in a straight line for jet-propelled aircraft, established by Brig.-Gen. W. E. Eubank, Lt.-Col. K. R. Rea, Maj. C. Wells and five other crew members in a Boeing KC-135 Stratotanker (four Pratt & Whitney J57-53W turbojets), from Tokyo to Lajes, Azores, on April 7-8, *16,462.5 km. (10,230 miles)*.

The United States now holds all five World's records recognized by the F.A.I., plus the aeroplane height record and the straight-line distance record for jet-propelled aircraft.

Treble One Transport

LATEST project of Handley Page is the H.P.111 jet transport, based on the Victor bomber, whose crescent wing it uses. The H.P.111 would be able to carry 200 troops or nearly 27 tons of freight over 3,800 miles; alternatively, 90 troops or nearly 13 tons of military equipment could be transported 5,750 miles.

The H.P.111 could be used as a tactical freighter carrying a 15-ton load 850 miles and landing on small, roughly prepared airfields. Such loads could consist of a complete Scottish Aviation Twin Pioneer, a Bristol tandem-rotor helicopter, five ¼-ton Army trucks with trailers and crews or two field guns with trucks and 36 men. A runway of 1,000 yd. would suffice for landing. A total of 120 paratroops could be carried and these would jump in groups of four.

Two features of the H.P.111 which would help small-airfield performance are the use of blown flaps and reverse-thrust, which latter would be used to slow the approach in addition to reducing the landing run. In civil form 168 passengers could be carried, or 115 for mixed-class Atlantic travel.

An artist's impression of the new Handley Page transport project based on the Victor. Details are alongside.

N.A.C.A. into N.A.S.A.

AN important piece of American aeronautical news that does not seem to have received much attention on this side of the Atlantic is that on June 2 the House of Representatives passed and sent to the Senate a Bill to create a civil National Aeronautics and Space Administration (N.A.S.A. for short). This new body will have the responsibility of developing a national space programme, will direct all space research and exploration and will co-operate with the Defence Department on purely military space projects. As such, it will absorb the present National Advisory Committee for Aeronautics.

In the terms of reference of the new body, provision is made for it to be headed by a presidentially appointed $22,500-a-year Administrator, who will be assisted by a Deputy Administrator. In addition, the N.A.S.A. will be authorized to hire 10 scientists and engineers at up to $21,000 annually each, plus an additional 250 at up to $19,000 each.

First Administrator of this civil National Aeronautics and Space Administration is to be Dr. Hugh L. Dryden, Ph.D., Hon. F.R.Ae.S., Hon. F.I.A.S., who has been Director of the N.A.C.A. since 1947. He was vice-chairman of the aerodynamics committee of the N.A.C.A. from 1941 to 1947 and Associate Director of the National Bureau of Standards from 1946 to 1947. Dr. Dryden was president of the Institute of the Aeronautical Sciences in 1943 and delivered a memorable 37th Wilbur Wright Memorial Lecture to the Royal Aeronautical Society in 1948.

According to reports, a nine-man board is to be set up to establish the new organization's policy. In addition to Dr. Dryden, this board will include the American Secretary of State, the Defence Secretary, the chairman of the Atomic Energy Commission, three independent citizens (probably prominent scientists) and another government official who, it is said, will have some military background.

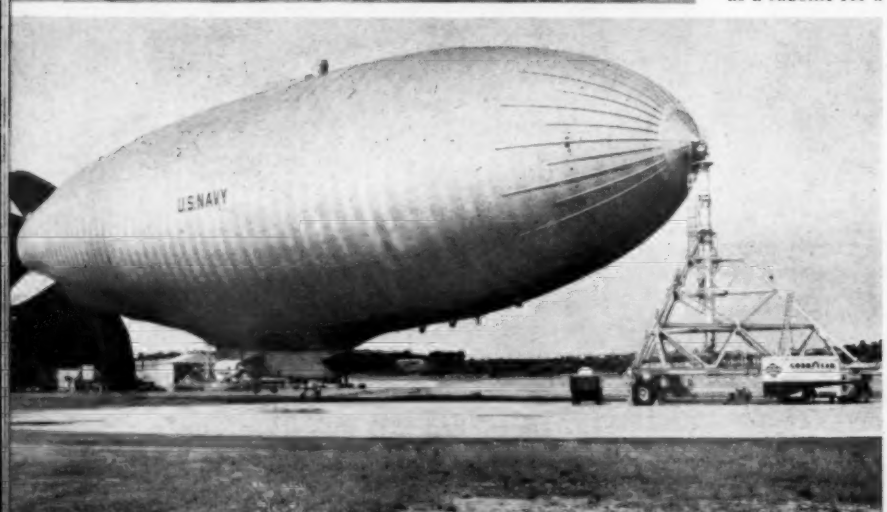
A New American Airship

CLAIMED to be the largest non-rigid airship ever built, the first of a new class of Goodyear airships for the U.S. Navy made its first flight on July 21. Designated the ZPG-3W and intended specifically for airborne early warning (A.E.W.) picket patrol duties, the new craft is powered by two 1,525 b.h.p. Wright 1820-88 radials driving propellers mounted on outriggers extending from each side of the control car. It will carry a crew of 21. On its first flight under the command of Dean Mealy, Goodyear's test pilot, it was airborne for 4 hr. 34 min.

Details of the size and performance of the new airship are not available, nor has it been said how many are to be built. According to reports, however, it is some 50% bigger than its predecessor, the ZPG-2, which had an envelope volume of about 1,000,000 cu. ft. The ZPG-3W is expected to have a much superior performance to any A.E.W. craft in existence and will be equipped with all the latest electronic detection equipment.

An interesting feature is that the envelope is made to serve as a radome for a "gigantic" internally mounted radar antenna system. The principle was tried out on one of the Goodyear ZPG-2s—a production A.S.W. (Anti-Submarine Warfare) craft modified for early warning work and known as the ZPG-2W.

News of some German airship projects is given by Lord Ventry on page 179.

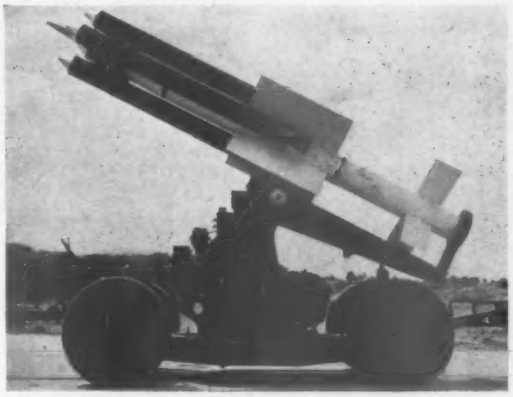


EARLY WARNER.—These two photographs of the new Goodyear ZPG-3W non-rigid airship, for airborne early warning patrol duties with the U.S. Navy, show its general similarity to its predecessor the ZPG-2W. This new craft, however, is some 50% larger and has a much improved performance.

News of Aircraft, Engines and Missiles

SUPERSONICS FOR TWO.—A two-seat trainer version of the English Electric P.1 jet fighter, designated the P.11, has been ordered by the Ministry of Supply for the R.A.F. It has two Rolls-Royce Avon turbojets and the full range of operational equipment is retained. The P.11 differs mainly from the single-seater in having a widened front fuselage to accommodate two seats side by side.

ANOTHER COMET 4.—The second production Comet 4, G-APDB, made its first flight from Hatfield last Sunday, July 27. Commanded by Mr. Pat Fillingham, de Havilland's senior production test pilot, and with Mr. Geoffrey Pike as co-pilot, the Comet was airborne for 4¼ hours—from 10.40 hrs. to 14.55 hrs.



NEW SEASLUG.—First photograph of a new Seaslug test vehicle with four single booster rockets in place of the four triple units used hitherto.

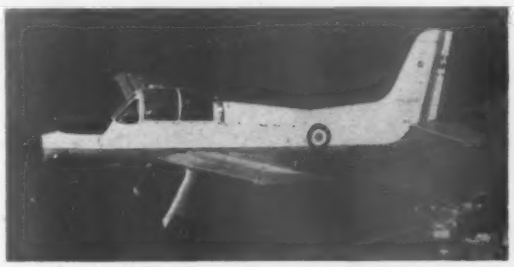
NEW TURBOJET.—Shown for the first time is the Pratt & Whitney JT12 small single-spool turbojet, weighing 430 lb. and producing 2,900 lb. static thrust. Pre-flight tests have been completed. The engine has missile and drone applications and is also being studied for military and civil aircraft.

A POLISH FIRST.—The first flight of the P.Z.L. M-2 light sporting aircraft was made at Mielec on June 26 by test pilot T. Golebiowski.

MARTIN-BAKER EXPANSION.—Negotiations are in progress between the Martin-Baker Aircraft Co., Ltd., and the Air Ministry for the purchase of Ballyhalbert Aerodrome, Co. Down, Ireland. It is understood that the company's factory at Denham cannot be further expanded and a supplementary works in a new locality is to be opened.

NEW SAILPLANE.—During the week-end a two-seat sailplane, the Harbinger, built by Mr. Fred Coleman, of Rugby, to the designs of Messrs. Czerwinski and Shenstone, flew at Hucknell. It was then taken to Camphill.

Main feature of the wooden design is the sweep-forward on the inner wing to give good visibility to rear cockpit. The 60-ft. wing of very thin section is single strut-braced and has a maximum t/c ratio of 13%.



MULTI-PURPOSE.—Flight testing of the Morane-Saulnier MS. 1500 Epervier is continuing. At present powered with a Turboméca Marcadau engine, the Epervier is soon to be fitted with the more powerful Bastan turboprop of 700 s.h.p.

S.E.P.R. SOLID.—The S.E.P.R. 734 is a solid propellent boost rocket for missiles. It has a total impulse of 150 tons./sec. and a weight of 1,850 lb.

C.A.A. CERTIFICATION.—The Hi-Shear Rivet Tool Co. announces the award of type certificate No. 4820 by the C.A.A. to the Ag-2 farm and forest aeroplane. Designed and manufactured by the Transland Division of the Company, the Ag-2 is now available for agricultural and forestry service throughout the World.

"Keep absolutely still—I don't think it's seen us yet."

NEW 1,000-km. RECORDS.—The F.A.I. has confirmed the following records: Speed over 1,000-km. closed circuit (France); Pierre Galland, Etendard IV (3,700-kg. SNECMA Atar E.4), Istres — Cazaux — Istres, January 18, 1958, 1,025.315 k.p.h. Bernard Witt (France), Breguet 1001/01, F-ZWUX (2,200-kg. Bristol Orpheus 3), Istres—Cazaux—Istres, April 25, 1958, 1,050.636 k.p.h.

TAON AGAIN.—For the second time, the Breguet 1001 Taon (powered by a Bristol Orpheus B.Or.3) set up a new 1,000-km. closed-circuit speed record on July 23. The speed of 1,075 k.p.h. (668 m.p.h.) was attained at about 20,000 ft. in a 50 k.p.h. (31 m.p.h.) wind. The pilot was Bernard Witt.

HELICOPTER RECORDS.—Recently confirmed by the F.A.I. are the following helicopter records (Class E): Speed over 100-km. closed circuit; Irina Gourova (U.S.S.R.), Mi-1 helicopter (575-h.p. AI-26B engine), Tushino — Istra — Golizino, March 28, 1958, 175.459 k.p.h. Class E.1d (1,750-3,000 kg.). Distance in closed circuit; Vassili Riakhovsky, Mi-1 (575-h.p. AI-26B engine), 1,950 kg. weight, Tushino — Kalouga — Riazagne, March 24, 1958, 555.376 km. Speed over 1,000-km. closed circuit (Class E.1d); A. Avidzba (U.S.S.R.), Mi-1 (575-h.p. AI-26B engine), weight, 1,950 kg.; Tushino — Istra — Golizino — Tushino, March 5, 1958, 176.652 k.p.h.

Commercial Aviation Affairs

INTER-AIRPORT SERVICE.—On July 21 an Orly-Le Bourget helicopter service was inaugurated. This picture shows an Alouette II arriving at Le Bourget after the first run.

FERRY INCREASES.—During the eight months October, 1957-May, 1958, inclusive, Silver City Airways' U.K.-France vehicle traffic increased by 99% while surface-carried traffic increased by nearly 20%. In May Silver City reported an 85% increase over the figure for the same month in the previous year. The April and May figures were nearly a quarter of those for the total surface and air traffic. Between October 1, 1957, and July 1, 1958, Silver City carried 18,654 cars and 52,585 passengers between the U.K. and France.

ELECTRA TOUR.—According to *Aviation Daily*, a Lockheed Electra is to make a tour of the Middle East later this year. It will fly on to India and New Delhi in time for the IATA Annual General Meeting which is to be held in that capital from October 27 to October 31.

GATCO CONVENTION.—Among the events at the Guild of Air Traffic Control Officers Convention (Southend-on-Sea, October 23-24) will be a lecture by a member of the U.S. Civil Aeronautics Administration on A.T.C. problems and an "any questions" session with a panel of industry and A.T.C. members.

AIR INDIA OFFICE.—A new London office was opened by Air India International on July 18 at 17/18 New Bond Street, London, W.1. This office replaces the previous administrative office in Curzon Street and the booking office in Haymarket.

GERMAN CONVAIRS. — Condor Luftreederei, the Hamburg charter company, have purchased two Convair 440 Metropolitans and the first has already been delivered. Condor Luftreederei was formed last November by Dr. Rolf H. Kersten, managing director of the Oetker shipping companies.

F-27s FOR ANSETT.—Six Fokker F-27 Friendships have been ordered by Ansett-A.N.A.; the contract was signed by Mr. R. M. Ansett last week and they are to be delivered during the second half of 1959 and early in 1960. This order follows naturally on those for 12 by Trans-Australia Airlines and for two by the Australian Department of Civil Aviation.

TU-114 DEMONSTRATION. — The second Tu-114D recently completed a 21,375-mile acceptance flight with Aeroflot and Press representatives on board. The flight was made in four long stages, covering large areas of the U.S.S.R. and including a first stage of 5,590 miles from Moscow to Vladivostok which was flown in 13 hours. The entire round flight was made in an elapsed time of 77 hours, including 48 hours in the air.

LUFTHANSA FIGURES. — During the first three years of North Atlantic operation (up to May 15) Lufthansa carried 132,256 passengers and 1,859 tons of freight.

312s IN AFRICA.—On July 27, B.O.A.C. introduced Britannia 312s on their flights to Central and South Africa. The 312s are laid out for 20 first-class and 54 tourist-class passengers.

S.A.S. RIGHTS.—A new agreement between the U.S.A. and Scandinavian Governments has been signed. This provides for permanent Arctic route rights to Los Angeles and gives S.A.S. traffic rights between Anchorage, Alaska, and Europe on the Tokyo service.

LUFTHANSA CHANGE.—On July 30 Lufthansa opened new London passenger offices at 29 Piccadilly, W.1. The sales, reservations and accounts offices will, however, remain at 117-119 Regent Street, where the cargo section will also be situated.

MOROCCAN CARAVELLE.—Royal Air Maroc has ordered one S-A Caravelle with an option on a second. A total of 45 Caravelles have now been ordered by six airlines.

THE NORTHEAST ORDER.—As recorded in last week's issue, Northeast Airlines have ordered nine Viscount 745Ds, with an option on a tenth. Here is a picture of the order signing, with, from left to right: George Gardner, chairman of Northeast, James Austin, president of Northeast, Floyd Odlum, chairman of the Atlas Corporation and Sir George Edwards.

FRANCE AND THE U.S.A.—The French Government have given the U.S. State Department a year's notice of their intention to terminate the 1946 air agreement between the two countries. The principal difficulty has concerned the refusal of the U.S. to permit west coast traffic rights to Air France for their Arctic service.

INDEPENDENT BRITANNIA. — As we go to press we learn that Air Charter are to put a Britannia into service in September on trooping and general charter work. It will be a Type 307—a variant of the Type 305 previously on order by Northeast Airlines.

C.S.A. VERSUS AEROFLOT.—The Czech airline, C.S.A., which has three Tu-104As, appears to be giving Aeroflot stiff competition on the Moscow-Prague run. C.S.A. leaves Moscow about 45 minutes ahead of Aeroflot on the flight to Prague and also returns from Prague ahead of Aeroflot. One observer, flying with Aeroflot from Moscow to Prague in June, noted that the C.S.A. aircraft left Vnukovo with nearly a full load of passengers, whereas the Aeroflot Tu-104A had 40 empty seats out of 70. C.S.A., it is reported, serves a much better meal on this flight.

K.L.M. TO MOSCOW.—The first weekly Amsterdam-Moscow service was flown by K.L.M. on July 21 with a Douglas 6B.

T.C.A. JETLINERS.—Trans-Canada Air Lines announce that their DC-8 Jetliners will be furnished to carry 28 first-class and 99 economy-class passengers, each section having its own double galley, washrooms, cloakrooms and public-address systems. The first-class accommodation will include an 8-seat lounge at the front of the cabin. There will be two passenger doors and two service doors.

SWISSAIR IN LONDON.—The new London administrative offices of Swissair, at 54-62 Regent St., W.1, are now in use.

BRAZILIAN SURVEY.—International Aeradio have recently completed a seven-week survey of Panair do Brasil's communications organization.

C.A.A. CONTRACTS.—Recent contracts announced by the C.A.A. as part of the U.S. Airways Modernization Programme cover the modernization of 50 airport surveillance radars (ASRS), the purchase of 19 new ASRS of an improved type, and the purchase of six additional long-range units.

ELECTRA DELIVERY.—Lockheed delivered an Electra to the Allison Division of General Motors on July 16 for continuation of the powerplant trials. It will be flown on airline-type schedules from Indianapolis. Electras have now totalled approximately 600 hours' flying time.

Military Aviation Affairs

GERMAN SEA HAWKS.—The first eight aircraft of the German Naval Air Arm order for 68 Armstrong Whitworth Sea Hawks were ferried by German pilots from Bitteswell to Jagel, near Kiel, on July 22. The remaining aircraft will be ferried to Bremen by the maker's test pilots.

V-BOMBER FLIGHTS. — Following the weekly training flights by single Bomber Command V-bombers to such places as Malta, Kenya and Aden, similar flights to Canada and the U.S. are to start shortly. There are four reasons why the Air Ministry values these flights: they strengthen the links with other air forces; they demonstrate our independent deterrent; they help the sale of British aircraft, and they give crews operating experience while away from their home bases.

R.N.A.S. CULDROSE.—By January of next year R.N.A.S. Culdrose is expected to be the largest Naval Air station in the country. Already the establishment for air signal and observer training, and squadrons for radio warfare, the station is to take over the School of Aircraft Handling, the School of Meteorology and the Photographic School. All Naval helicopter squadrons are to be based at Culdrose, which will also be responsible for the air training of Dartmouth cadets.

COASTAL EQUIPMENT.—The programme to re-equip a number of R.A.F. Coastal Command squadrons with Avro Shackleton MR.3s is expected to be completed by the end of the year.

ROYAL JET.—His Imperial Majesty the Shah of Iran has taken delivery of a Morane-Saulnier MS.760 Paris aircraft.

TEN A DAY.—The American magazine *Look* is reported to have stated that an average of more than 10 United States military aircraft a day have crashed on peace-time missions in the last five years. According to the report, aircraft losses during this period have exceeded 19,000.

News About People

CAPITAL RESIGNATION.—According to news from Washington last week, Mr. J. H. Carmichael has resigned from his position as chairman of the board of Capital Airlines. He has held this position since August, 1957, and was previously president. He had been with Capital and its predecessors, including Pennsylvania-Central Airlines, since 1929. It is expected that Mr. Carmichael will be succeeded by Mr. Charles H. Murchison, who is the largest single shareholder in the airline.

CIERVA MEMORIAL.—First prize of £50 for the 1957 essay, sponsored by the Helicopter Association of Great Britain, was won by Mr. T. Opatowski. The competition was open and a paper was required on the rotary wing. Mr. Opatowski's paper "The Stability of Flying Platform Type Helicopters," is to be published in the *Helicopter Association Journal*, Volume 12, No. 5, October, 1958.

PLESSEY INTERNATIONAL.—Mr. P. W. Faulkner, O.B.E., general manager of the Chemical and Metallurgical Division of the Plessey Co., Ltd., since 1953, has been appointed a director and general manager of Plessey International, Ltd. He joined Plessey in 1952. He remains an executive director of the Plessey Co., Ltd., and a director of Technical Ceramics, Ltd.

I.A.C.'s CHAIRMAN.—Mr. J. R. D. Tata, chairman of Air-India International, has, it is reported, agreed to take over the chairmanship of the Indian Airlines Corporation as from November.

AIR/SEA RESCUE. — The British Institution of Radio Engineers has announced that the 1957 Brabazon Premium for the most outstanding paper on radio aids to aircraft safety has been won by Mr. W. Kiryluk for his paper "The TALBE—A VHF CW Radio Aid for Air/Sea Rescue," published in September, 1957. Mr. Kiryluk is with Burndept, Ltd., of Erith, Kent.

U.S. EMPLOYMENT.—According to the latest report by the Bureau of Labor Statistics, employment in the U.S. aircraft and parts industry continued its decline in March, 1958, there being 765,400 workers compared with 767,900 in February. Average monthly employment during 1957 was 878,100, with a peak employment of 909,100 in April of that year. The decline from then until March of this year represents a decrease of about 16%.

KETAY SALES.—Newly appointed sales manager of Ketay, Ltd., manufacturers of synchros and servo components and systems, is Mr. G. E. Sugden. Before joining the company he was assistant manager of the aeronautical department of the Sperry Gyroscope Co., Ltd.

ESSAY AWARDS. — The Gravity Research Foundation of New Boston, N.H., U.S.A., has made the following awards for essays: "A Search for Anisotropy of Inertia" (Professors G. Cocconi and E. Salpeter, $1,000); "A Proposed Laboratory Measurement of the Velocity of Propagation of Gravity" (Dr. Q. A. Kerns, $300); "New Experiments in Gravitation Physics" (Dr. J. Weber, $200); "Stabilization of the Elementary Particle by Self-gravitational Forces" (Dr. W. H. Bostick, $150) and "On the Breakdown of Newton's Law of Gravitation at Great Distances" (Dr. F. Zwicky, $100).

GEN. C. L. CHENNAULT.—We regret to record the death of Lt.-Gen. Claire Lee Chennault, 67, who died in New Orleans on July 27. Trained as a military pilot in the 1914-18 War, he commanded, recruited and trained the volunteer group of American airmen known as "The Flying Tigers" in the war against Japan. Officially called the American Volunteer Group, they were later absorbed in the 14th U.S. Air Force. Made a C.B.E., he retired in 1945.

MAJ. I. KINCHELOE.—We are sorry to record the death of Maj. Iven Kincheloe, U.S.A.F., 30, on July 26 when the F-104 Starfighter he was piloting crashed shortly after taking off from an air base in the Mojave Desert, Calif. A member of a three-man team which had been training for flights into space in the still-uncompleted Bell X-15 rocket aircraft, Maj. Kincheloe held the American height record of 126,000 ft.

BRYANS DIRECTOR.—With regret we record the death of Mr. H. D. Strawson, production director of Bryans Aeroquipment, Ltd. He died on June 28, aged 65.

CADETS-I.—A party of air cadets from America, Canada, Holland, Italy, France, Sweden and Turkey marching to Buckingham Palace last week to be received by H.R.H. The Duke of Edinburgh. The cadets are attending the international cadet exchange conference in Britain.

CADETS-II.—Air Training Corps and Combined Cadet Force cadets with their escorting officers left Northolt on July 19 for a tour of Canada. Forming part of the international air cadet exchange scheme (THE AEROPLANE, July 25), the visit will last three weeks.

Air Transport

B.O.A.C.'s Poor Year

THE report and accounts of our senior airline Corporation were issued for publication yesterday morning. As already forecast, a loss was returned for the financial year and this can be attributed partly to the business recession which has been affecting many of the World's airlines.

The year ended with a small surplus on the Corporation's own operations of £129,122. However, their associated and subsidiary companies caused an overall loss of £590,748, and this, coupled with the interest on capital, involved a total business loss of £2,839,350. Nevertheless, the Corporation's gross revenue, at £53,526,375, was the highest in their history.

A load factor of 60.5% was achieved—by comparison with an estimate of 64.4% and with a figure of 63.7% achieved in the previous financial year. The effect of this reduction in expected average loads can be gauged from the fact that a difference of 1% in the load factor means one of something like £900,000 in the overall result.

We shall deal with the report and accounts in detail in next week's issue.

About the Civil Conways

MINIMUM guaranteed thrust figures for different commercial versions of the Rolls-Royce Conway have now been published and are especially interesting in that they *are* guarantees. The first commercial version is the R.Co.10 at 16,500 lb. s.t. At a later date (the actual timing of these variants has not been revealed) come the R.Co.12 and R.Co.14 at 17,500 lb. s.t. and the R.Co.15 at 18,500 lb. s.t.

The civil Conway is at present scheduled for use in the Vickers V.C.10 and in versions of the Douglas DC-8 and Boeing 707. Figures for both the American types with the 16,500-lb. R.Co.10 appeared in our Commercial Aircraft number of July 4, together with a specification for the DC-8 with R.Co.12s.

In connection with the data in this issue, incidentally, it is worth pointing out that the Pratt & Whitney JT-4A-3, in its initial form for the DC-8 and 707, is rated at 15,800 lb. s.t. and not 17,000 lb. as we suggested. The latter rating is approximately correct for the JT-4A-9, a comparable development stage to that of the Conway R.Co.12.

The particular version of the Conway to be used in the V.C.10 has not been revealed, but it can be assumed that it will be of the highest rating available in 1963 when the aircraft is scheduled to go into service.

Good Work by the Comet 2Es

BETWEEN September 16, 1957, and July 23, 1958, when the B.O.A.C. development and training programme was completed, two Comet 2Es (one owned by the Corporation and one by the Ministry of Supply) have flown a remarkable total of 3,725 hours, during which there was only one unscheduled engine change.

Two of the four turbojets in the Comet 2Es are Rolls-Royce Avon 524s—and a programme of 3,500 engine hours was completed in June. These engines have now been certificated for an inter-overhaul life of 750 hours and this figure is likely to be increased before the Comet 4 enters service.

The Comet 2E began the first phase of its work with B.O.A.C. by a series of flights between London and Beirut. Each round trip of 4,560 miles was completed in about 12¼ hours, including one hour on the ground at Beirut, and, with the help of the Ministry of Supply 2E, a total of 11 flights a week was made. Towards the end of the Beirut operations some flights were also made to Nairobi.

The second phase, involving North Atlantic operations, started on May 5, and initially 10 return flights were made between London and Gander to provide experience in command to captains chosen for possible future Atlantic services. The round trip involved a total of 12¾ hours, and stops were made at Keflavik (Iceland) on the westbound journeys.

Later there were more flights to Gander, which was then used as a base for local flying to alternates on the North American Maritime Coast—including Monckton (New Brunswick), Sydney (Nova Scotia), Goose Bay (Labrador) and Stephenville (Newfoundland). More recently an airport familiarization programme was completed, including instrument approaches and touch-downs at other Canadian and American airports—among them Idlewild, New York.

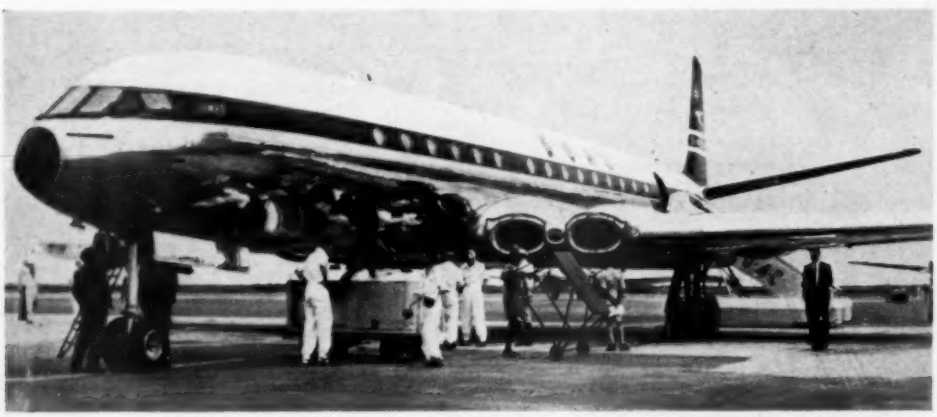
Policies for the Turbojets

PAN AMERICAN AIRWAYS have been given permission by the Port of New York Authority to operate trial flights with the Boeing 707 between Idlewild and San Juan, Puerto Rico. These flights had already been planned as an introductory cargo-carrying exercise on a daily or more frequent schedule, but the C.A.B. refused permission for the carriage of cargo or mail prior to the certification of the aircraft.

According to *Aviation Daily*, the 707, with observers and technicians on board, will be operated under a provisional licence with a take-off weight limitation of 190,000 lb.—or 57,000 lb. less than the maximum certificated weight.

Meanwhile, the Paris authorities have been outlining their plans for the operation of Boeing 707s and Tu-104s out of Orly and Le Bourget. They are reported to be extremely anxious that there should be no adverse public reaction during the early stages of turbojet operations and are proposing to route these aircraft with great care and to follow the flight paths by radar. Obviously, meticulous pattern-flying will demand strict discipline on the part of the flight crews.

A 10,500-ft. E.W. runway is expected to be available at Orly during the summer of 1959. Until then—since the 7,874-ft. N.S. runway is badly placed from the noise point of view as well as being on the short side—the turbojets will presumably use Le Bourget. The present main runway at Le Bourget is 7,874 ft. in length; this is to be extended to 7,925 ft. and a new runway, 9,150 ft. in length, is to be laid down.



ON TROPICAL TRIALS.—The first production Comet 4 is now completing tropical trials and this photograph shows it on the apron at Nairobi Airport, Embakasi. The second Comet 4, as recorded on p. 159, made its first 4½-hour flight from Hatfield last Sunday.

The New Vanguard

IN last week's issue (p. 125) we outlined some of the facts about the latest development of the Vickers Vanguard—the weight and performance figures for which had already been included in the tables published in our Commercial Aircraft Number of July 4.

The new Vanguard has, in effect, been stretched structurally (though not in physical dimensions) so that it can offer an optimum payload/range performance over shorter stage distances. By means of appropriate structural and undercarriage modifications the maximum permissible zero-fuel and landing weights have been increased so that, with some fuselage strengthening, a much higher payload can be carried over these shorter stages.

With normal allowances, including an hour's holding and a 200-naut. mile diversion, the developed Vanguard can carry a payload of 29,000 lb. over a distance of rather more than 1,500 naut. miles. Using a 139-seat economy-class layout, with six-abreast seating, this increase in payload reduces the direct seat-mile costs to about 0.85d. (1.0 cents) at 900 miles, or 1.4d. (1.6 cents) at 200 miles, when using the U.S. Air Transport Association's formula. With a tourist-class, 97-seat layout, the figures are about 1.4 cents and 2.4 cents respectively.

Assuming a 65% load factor with the 139-seater layout, there would remain a residual weight payload capacity for about 10,000 lb. of freight in the underfloor holds where there is 1,360 cu. ft. of space.

Vickers have worked out some interesting prospective fare figures for the economy-class Vanguard when flown over certain routes in Europe and the United States. In Europe the possible reductions vary between 29% and 50% of the existing fares and in the U.S.A. (when compared with coach-class fares) between 8.8% and 32.1% according to the route.

The proposed 139-seat thrift-class layout does not, incidentally, involve any changes to the present door and window arrangements. The Vanguard already has the necessary numbers of doors and ditching exits to meet airworthiness requirements when flying with this passenger load. Six-abreast seating is, itself, not unreasonable with an aircraft which has a 127-in. interior width of fuselage, and impressions of such seating (which has been installed in the forward compartment of the Vanguard mock-up at Weybridge) confirmed its acceptable level of comfort for comparatively short-period journeys.

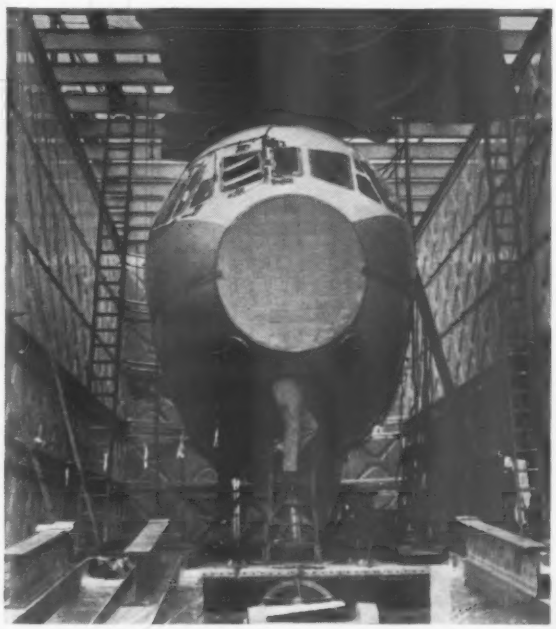
The detail modifications to the structure which will permit the higher payload can be incorporated in every Vanguard after the first 12 for B.E.A. and the new version is now being offered as a standard type for all prospective customers. The changes have involved some sacrifice in the performance as a medium-long-range aircraft, but with normal allowances (including one hour's holding and 200-naut.-mile diversion) the Vanguard is still capable of flying more than 2,200 naut. miles with a payload of 19,000 lb.

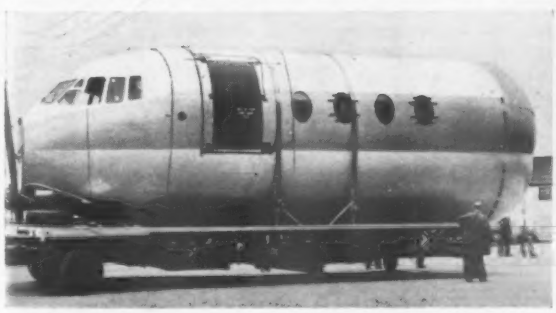
At Weybridge the first Vanguard is nearing completion and is due, as this article appears, to be starting its resonance tests. The second and third aircraft from the line will be flying approximately three and six months respectively after the first, and five aircraft will be flying before the end of 1959. These should by then have completed 1,600 hours between them—including tropical and winterization trials—and a full C. of A. should have been obtained early in 1960.

The front and rear passenger compartments of the first Vanguard have been furnished to B.E.A. standards and the remainder of the cabin is being fitted out with test observation and recording equipment. This equipment is being pre-assembled on a false floor before installation.

A complete aircraft (number two in the line) has been put aside for static strength tests. A forward section of the fuselage, approximately 400 in. long, is being tested under water to demonstrate the ultimate strength under pressure loads. This specimen includes the major cut-outs such as windscreen, nose-wheel bay, windows and doors.

The remainder of this aircraft is scheduled for a full programme of strength tests on all components under ground and flight loading. Functioning tests on control surfaces, flaps and undercarriage will be made with the aircraft under load. After completion of these tests, the two parts will be joined together





A complete fuselage of the Vanguard is being used in two parts for static tests. The pictures show the 400-in. forward section which is now (left) in the water tank for pressure strength-tests. Afterwards the two fuselage sections will be re-joined and used for further pressure and flight-loading tests. A second forward fuselage component is being built for pressure-cycle tests.

and pressurized in air to ultimate pressure. Fail-safe tests will then be made under pressure and flight loading.

The fatigue strength will be assessed from the results of two major component tests and of numerous detail tests, many of which have already been completed on items such as joints, cut-outs and flap-rails. Measurements of rate of crack propagation have also been made on samples of machined wing-skins and fuselage skins.

The results of these tests will be compared with those of the large-scale tests on a representative wing torsion-box and on a forward fuselage component. The wing torsion-box is being tested under a loading spectrum typical of that expected to occur in service. Testing work to date represents about 60,000 hours of flight, and X-ray examination has revealed no cracks and there have been no fuel leaks. The fuselage component will be pressure-cycled in temperatures varying between −70° and +45° C. Rates of crack propagation will be measured and the fail-safe characteristics assessed.

Noise in the House

FOLLOWING hard upon Lord Douglas' comments upon the difficulty of starting a London-Moscow service and the more general problems of aircraft noise control at civil airports (see THE AEROPLANE for July 25, page 126), questions about both topics were raised in the House of Commons on July 23. As Mr. Watkinson pointed out, the two points are related. So far as the Moscow service is concerned, he said that final arrangements were consequent upon adequate silencing of the Tu-104s which Aeroflot propose to use on this route. Marshal Zhigarayev told him personally, while in London, that there should be no difficulty in silencing this aircraft; since then, there had been no word from Russia.

Mr. Watkinson said he was most anxious that this service should start. Pressing inquiries had been made through "the proper channels" for an answer, without any result so far.

When asked, by Mr. Frank Beswick, what discussions he had, during his visit to the U.S.A., with regard to international agreement on the control of aircraft noise, Mr. Watkinson made the following statement:

"I have had a most useful exchange of views with the Port of New York Authority following discussions in London among representatives of the Western European airport authorities. It seems to be generally accepted, on the basis of information so far available, that unless there is further progress in engine silencing the operations of large jet aircraft at airports in built-up areas will have to be somewhat restricted if they are not to cause considerable disturbance.

"The restrictions, which will vary from place to place, are now being studied by the authorities responsible for the major airports, who have undertaken to keep each other closely informed."

Mr. Watkinson also said that while in America he had issued a very warm invitation to American operators to bring the Boeing 707 to London as soon as possible and test it under actual conditions.

Air Age Education

IN the course of a few hours spent at New York's International Airport recently, a member of the staff of THE AEROPLANE discovered, almost by accident, an example of the way in which interest in aviation, and more specifically in air transport, is being fostered in the U.S.A. It is widely recognized, of course, that the U.S.A. is already far ahead of any other region in the acceptance of air transport as a primary and basic transportation medium; but it was interesting to find that very deliberate and strenuous efforts are being made to encourage this acceptance. We cannot recall, off-hand, a similar project in Britain to that which we saw at Idlewild; we would certainly like to see something organized along these lines.

This particular example was an Air Age Education Institute arranged by the Education Committee of the National Air Transport Co-ordinating Committee, in the course of which a group of school teachers and supervisors spent some six hours at Idlewild. The party of about 60 was in fact the 17th such group of teachers to attend the Institute in the school term, which began last September, and programmes of this kind have been held regularly during each school session for the past six years.

During the evening (the course begins at 4 p.m.) the teachers hear a general talk on education in the air age; are briefed on the function of an airport; make a tour of Idlewild; listen to an address on safety and air traffic control; have dinner; and finally are taken on a 45-minute flight by one of the sponsoring airlines.

The object of these courses—which cost the individuals only the price of their dinner—is to give teachers some idea of the place of air transport in the community today; to help teachers to understand their students' knowledge of and enthusiasm for aviation; and to provide a basic fund of information. At the end of the evening, each teacher receives a heavy (3 lb. 9 oz.) package of material for classroom use and to provide a basis for follow-ups. Experience has shown that most of those who attend go back full of enthusiasm about the airport and about aviation. Incidentally, it has also been found that 60% of participants have never flown before and the flight is understandably a popular feature of the programme.

On the Education Committee of N.A.T.C.C. are representatives of the Port of New York Authority and the C.A.A. in addition to ten U.S. airlines, which take it in turn to sponsor the flight. The whole project seemed to us to be an admirable way of spreading the gospel of air transport and is also a good piece of community relations—which, as it happens, is one of the principal reasons for existence of the N.A.T.C.C.—F.G.S.

NORTHEAST IN SOUTHWEST.—Photographed at Vickers' Hurn works in south-west England, where it was built, is the first of Northeast Airlines' nine Viscount 745s. These aircraft were completed a year or so ago, having been laid down for Capital Airlines.

El Al and the Britannia

ONE way and another, El Al Israel Airlines have done, indirectly, an extremely good prestige-building job for the British aircraft industry and for the Britannia in particular. Their long-haul operations with the 313s have been a near-perfect example of the way in which good pre-planning and hard work can make a success of a difficult venture for a comparatively small organization.

During the first six months of Britannia service, El Al have made 190 Atlantic flights and all but four of these were made non-stop. Of the four steps, three were made because terminal weather conditions at New York International Airport demanded an intermediate diversion. Aircraft utilization during the final two of the six months averaged 8.5 hours per day, or better than 3,100 hours per year.

Since June 1, El Al have been flying five services a week between Tel Aviv and New York—three via London and two via Paris. Overall passenger loads have been twice those for the same period of 1956-57, and the Atlantic passenger loads have trebled.

El Al have now taken up their option on a fourth Britannia and this is due to be delivered in February-March next year. Meanwhile they have leased an aircraft from Bristol. This is the first of the 305s which were due to go to Northeast Airlines and is, in fact, the aircraft which recently completed a tour of South America.

Aliens in Transit—A Legal Ruling

THE Aliens' Order 1953 provides generally that aliens may land at approved ports in this country for transit purposes. Airline operators and airport officials may not always appreciate that this straightforward provision can lead to difficulties with immigration—as a High Court case, Kuchenmeister *v.* Home Office, showed.

The cause of the trouble in this instance was the roadway linking the North Side with the Central Area at London Airport. In April, 1955, Kuchenmeister, a German national, who had been permanently expelled from Britain in 1948 and had since lived in Dublin, disembarked at 18.00 hrs. from a K.L.M. aircraft at the North Side. He had shortly before flown direct from Dublin to Amsterdam and had taken a through ticket to return to Dublin. At Amsterdam he had been told that the K.L.M. aircraft went only as far as London and he would have to change there into an Aer Lingus aircraft, which meant going to the Central Area.

He went into the immigration hall with the other passengers, showed the official his passport and registration certificate under the Aliens' Order and informed him that he was going direct to Dublin. He stated on his landing card he was in direct transit to Dublin only. Kuchenmeister was then kept waiting in a corner of the hall until 20.20 hrs. From time to time he protested that he had no desire to enter the United Kingdom and was in transit only; at 20.00 hrs. he pointed out that the Dublin aircraft left at 20.40 hrs. and he had to be at the departure point 40 min. beforehand. Finally, at 20.20 hrs., he was driven over to the central passenger building but though the immigration officials did their best the operating company said he was too late to embark. Accordingly Kuchenmeister had to spend the night in the transit lounge and was put into a Dublin aircraft at 07.45 hrs. the following morning. He brought an action for wrongful imprisonment.

It transpired that while he had been kept waiting the immigration authorities had been making inquiries as to what should be done, as he had no permission to land and had to travel about a mile along what, in effect, was a public road to reach his aircraft. They had telephoned the Department of Justice of the Irish Republic to make sure that Kuchenmeister would be allowed to land in Dublin. Then the Home Office was asked for permission for him to go to the Central Area. This was not given until 20.20 hrs. when it was acted on at once.

The judge said this was not a storm in a teacup. The plaintiff, Kuchenmeister, had suffered inconvenience, annoyance and humiliation. The immigration officials believed that in strict law, under the Aliens' Order 1953, the plaintiff was not entitled to travel from the North Side to the Central Area. They did their best to inconvenience him as little as possible. Kuchenmeister was not in the position of having landed unlawfully. It was true he had done so without permission but only from an aircraft at an approved port to go into another aircraft at the same port and he stayed within the limits approved by immigration. In these circumstances his landing was lawful under the Order, Article 2(1)(b).

The defendants said it was in their sole discretion to fix the limits within which persons so landing could remain. The North Side was right on a main road. For obvious reasons aliens were confined to the transit hall and certain other buildings. If they were allowed to wander about or go unescorted to the Central Area all effective control would be lost. If Kuchenmeister wanted to go beyond those limits, said the defendants, he required leave to land which he had not got.

The judge went on that the crucial question was, assuming Immigration had not, as in this case, used their powers to grant, or refuse, leave to land could they, by exercising their discretion on the limits within which the alien must remain, defeat the purpose for which he had landed. The judge declared that, in his view, they were not entitled to do so in such a drastic way that the alien either had to go back where he came from or stay permanently in a small section of the airport. There was no danger in this interpretation of the order. Immigration could always refuse leave to land altogether and he inclined to the view that it was quite open to them to say that an alien must travel from the North Side to the Central Area in one of their cars or the aircraft company's vehicles with an official or a policeman.

The judge concluded that in this case £150 damages would be fair without being vindictive. He would have considered himself fully entitled to increase it considerably if there had been any question of ill-treatment. But there was none and he was satisfied that the Immigration officials genuinely believed they were doing the best they could in the circumstances.

It is difficult to understand why the Immigration authorities did not simply arrange for Kuchenmeister to be escorted over to the Central Area in time to catch his aircraft, particularly as they appeared to have complete discretion to fix their own limits. The affair has, however, at least led to a common-sense interpretation of the Order which should prevent such a difficulty arising again either at London or elsewhere in this country.—

LAURENCE WEBLEY.

COTE D'AZUR.—This informal picture, taken through a passenger window of an Airspeed Elizabethan, provides a good impression of the new terminal building, completed six months ago, at Nice's Côte d'Azur Airport. A new runway at Nice was completed comparatively recently.

Photograph copyright "The Aeroplane"

THE FIGHTING SERVICES

C.F.S. Commandant

AS recorded in THE AEROPLANE of July 18, the new Air Officer Commanding and Commandant of the Central Flying School, R.A.F. Little Rissington, is Air Cdre. J. N. H. Whitworth, D.S.O., D.F.C., who has succeeded Air Cdre. P. H. Dunn, C.B., C.B.E., D.F.C. Senior Air Staff Officer at Headquarters, No. 1 Group, for the past 3½ years, Air Cdre. Whitworth was previously Group Captain (Operations) at Bomber Command.

R.O.C. Recruiting

FOR the sixth consecutive quarter the Western Area of the Royal Observer Corps had an appreciably higher recruitment than the other five areas. During the quarter ending June 30 an additional 546 observers were recruited to the R.O.C., bringing its strength up to 15,331. To make this total the Southern Area has 3,384 personnel, the Western 3,152, the Metropolitan 2,706, the Northern 2,036, the Eastern 1,842, the Scottish 2,202, and nine at R.O.C. Headquarters.

All-commissioned Aircrew

UNDER a new scheme recently approved by the Australian Air Board, all R.A.A.F. pilots and navigators will be commissioned. Up to the present time, aircrew trained at R.A.A.F. flying training schools were in the musterings of Airman Pilot and Airman Navigator and graduated with the rank of Sergeant.

Starting with No. 34 Course, which is now at Uranquinty F.T.S., all pilots and navigators will be commissioned on graduation with the rank of Pilot Officer.

New A.T.C. Gliding Schools

THREE of the six new week-end gliding schools for the Air Training Corps are about to be opened in Cornwall, Gloucestershire and Bedfordshire. The gliders and other equipment have been supplied and cadets from local squadrons are now being selected for instruction.

The schools are No. 626 (Sqn. Ldr. A. N. Williams) at R.A.F. St. Eval; No. 625 (Flt. Lt. I. E. Moss) at R.A.F. South Cerney, and No. 616 (Flt. Lt. P. J. Bullivant) at R.A.F. Henlow. A fourth gliding school is to be established at R.A.F. Middleton St. George, Co. Durham, today, and will be ready for training pupils next month.

During the 12 months ending May 31 last, 1,435 cadets gained their gliding proficiency certificates and a total of 67,733 launches were made, including 6,188 solo launches. The formation of the six new week-end schools, which will bring the total up to 26, and the new full-time gliding centre due to be opened at R.A.F. Newton in October, will allow a further 800 cadets to be trained annually up to solo standard.

ROYAL TRANSPORT.—During the present visit of H.R.H. Princess Margaret to Canada the R.C.A.F.'s Canadair C-5 transport will carry Her Royal Highness for more than 3,000 miles. Operated by No. 412 Squadron, the flight crew (seen here beside a North Star) is, front row, left to right, Wg. Cdr. B. Carr (captain); Flt. Lt. D. Thompson (co-pilot); Flg. Off. D. Brown (navigator); Flt. Lt. E. Perron (radio officer), and second row, left, Flt. Sgt. A. Cooper (engineer).

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Group Captains: E. C. Harding, C.B.E., to Headquarters, No. 40 Group, for technical staff duties; E. J. Harrington, O.B.E., to Headquarters, F.E.A.F., for administrative staff duties.

Wing Commanders: W. C. Clements to Air Ministry for duty in the Department of the Air Member for Supply and Organization; R. C. Crosbie to Headquarters, Maintenance Command, for technical staff duties; A. E. Druett to Headquarters, Fighter Command, for administrative staff duties; P. J. Dunlop to Headquarters, No. 83 Group, for administrative staff duties; A. R. Glading to Air Ministry for duty in the Department of the Air Member for Supply and Organization; A. L. Hamilton to Headquarters, Fighter Command, to the Air Defence Operations Centre; J. M. Howard to Headquarters, Flying Training Command, for administrative staff duties; A. C. Kerr to Air Ministry for duty in the Department of the Air Member for Supply and Organization; J. L. Kerr to R.A.F. Abingdon to command Administrative Wing; R. J. Lewis to R.A.F. Topcliffe for technical duties; D. A. Pocock, O.B.E., to Air Ministry for duty in the Department of the C.A.S.; H. B. Scully to Air Ministry for duty in the Department of the Air Member for Supply and Organization; B. Spray to No. 19 M.U. to command; G. Steele, O.B.E., to Air Headquarters, Malta, for administrative staff duties; P. D. Thomson, D.F.C., D.F.M., to Manila as Air Attaché, and as accredited Naval and Military Attaché; G. C. Unwin, D.S.O., D.F.M., to R.A.F. Andover as President of the Standing Court Martial; L. Wakelin to No. 24 M.U. for technical duties; D. W. T. Withers, A.F.C., to Air Ministry for duty in the Department of the Air Member for Supply and Organization.

Squadron Leaders: H. R. Barrand to Headquarters, Fighter Command, for Control and Reporting duties (with acting rank of Wg. Cdr.); L. M. Courtenay to Air Ministry for duty in the Department of the Air Member for Supply and Organization (with acting rank of Wg. Cdr.); D. T. Fisher to the R.A.F. Staff College, Bracknell, for directing staff duties (with acting rank of Wg. Cdr.); D. C. Furse, D.F.C., to Headquarters No. 11 Group, as Wing Commander in charge of Training (with acting rank of Wg. Cdr.); R. S. Perry, D.F.C., to Headquarters, 2nd T.A.F., for administrative duties (with acting rank of Wg. Cdr.); P. D. Thorne, A.F.C., to R.A.F. Sylt to command the Flying Wing (with acting rank of Wg. Cdr.).

PILOT CONVERSION.—The first of the production Hawker Hunter T.Mk.7s for the R.A.F. are now going into service. These trainers, illustrated in this first published photograph of a production aircraft, are expected at No. 229 Operational Conversion Unit, Chivenor, in the early autumn.

BRISTOL'S LATEST TWIN-ROTOR HELICOPTER

(Drawings by Charles King)

ENJOYING the distinction of being Britain's first turbine-powered twin-rotor helicopter, the new Bristol Type 192, which made its first flight on July 5, has behind it a great deal of practical experience and achievement in helicopter engineering. For many years now, the Bristol rotary-wing team under the leadership of Raoul Hafner have steadily maintained their belief in the tandem-rotor layout for large multi-engined helicopters.

It is universally agreed that if the economics of operation are to be kept to an acceptable level then the helicopter itself must be large. There is, however, no such widespread agreement as to the best layout for the helicopter, and opinion is sharply divided on the question of whether a twin-rotor layout is to be preferred to a single one or vice versa.

In fact, although the trend seems to be towards the large single rotor, there is much to be said in favour of the tandem layout. For example, a desirable feature of any transport vehicle is the ability to accommodate indiscriminate loading, and if the permitted centre of gravity range of the machine is small, then the loading problem can be very troublesome. With a tandem-rotor arrangement such as that favoured by the Bristol helicopter team, this C.G. limitation is not likely to be anywhere near so acute as it would be with a corresponding large single rotor. It is claimed that such a layout offers the potential operator—military or civil—much greater freedom in loading and the disposition of passengers and freight within the cabin. Indeed, for certain specialized rôles, such as minesweeping and towing ships or vehicles, the wider C.G. range of the tandem-rotor craft offers added advantages.

So far as mechanical complexity is concerned, Bristols argue that the tandem-rotor helicopter is no more complicated than the "classical" version with a tail anti-torque rotor. Both machines, they say, have the same number of engineering elements—and the rear rotor of the single-rotor type provides nothing in the way of lift.

Bristols have, then, developed their tandem design by a process of step-by-step evolution from their initial single-engined single-rotor design, the Type 171 Sycamore. This has had the result that although the Type 192, powered by two Napier Gazelles, is, in effect, a brand-new machine, it nevertheless embodies a great many lessons that have been learned the hard way and it incorporates the detail refinements that have been suggested by a considerable amount of development running and test flying accomplished with the earlier twin-rotor Type 173.

Bristol's Type 192 has, however, been evolved as something more than just a logical development of past achievement. It has been designed specifically to meet Service requirements for a medium-size general-purpose helicopter capable of fulfilling such tasks as communication work, freight carrying, air ambulance duties, paratroop and supply dropping, search and rescue work, and anti-submarine patrol.

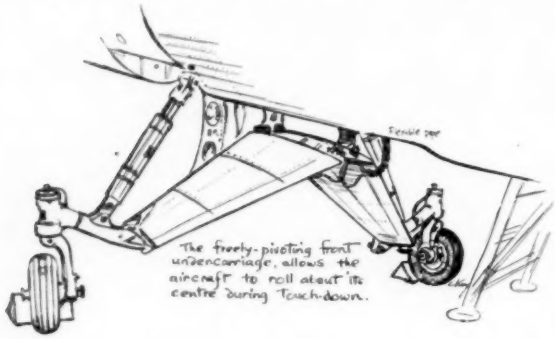
Although the development emphasis has been and will be—initially, at any rate—on the military applications of the machine, there are clearly some civil potentialities for it. There has, in fact, already been some reference to a civil Type 192C and Bristols are known to have project designs for civil machines with accommodation for up to 35 passengers.

Bristol's first essay in twin-rotor helicopters was their Type 173, which flew for the first time at the beginning of 1952 and made its debut at the S.B.A.C. Display of that year. This was intended as an experimental research aircraft and was based on the use of a pair of Type 171 main rotor heads, blade assemblies and transmission systems. This approach enabled the new craft to be produced more quickly than would otherwise have been possible and, at the same time eliminated a sizeable proportion of the inevitable "unknowns" by making use of well-proven components. The 173 was powered by two 520-b.h.p. Alvis Leonides engines—the same basic powerplant as used for the

single-engined Sycamore. And to provide the essential interconnection and synchronization of the separate rotor heads a shaft joined the two rotor gearbox drives. By this means, in the event of an engine failure, the remaining engine would continue to drive both rotors.

A second Type 173 flew in the summer of 1953 and was, to begin with, similar in its essential respects to the prototype. Later, however, as part of the overall development programme for the type, this second aircraft was fitted with stub wings and was seen at Farnborough in this form.

Another stage in Type 173 development was reached in 1953 when the prototype successfully completed a series of deck-landing trials with the Royal Navy on H.M.S. "Eagle"—thus



pointing the way toward possible future naval applications for large helicopters of this type. This promise was in fact fulfilled, some time afterwards, when it was announced that a shortened version of the 173, known as the Type 191 and specially designed for operation from aircraft carriers (the shorter overall length was dictated by carrier-lift requirements), had been ordered for the Royal Navy. This naval order was however subsequently cancelled—but an order for a "substantial number" of 173s for the R.A.F. remained.

This particular version was to be known as the Type 192 and initially was to be powered by 850-b.h.p. Leonides Major radial engines in place of the single-row Leonides. As a development step in this direction, a third prototype of the Type 173 was built and flown in November, 1956; it had the more powerful engine and four-bladed rotors.

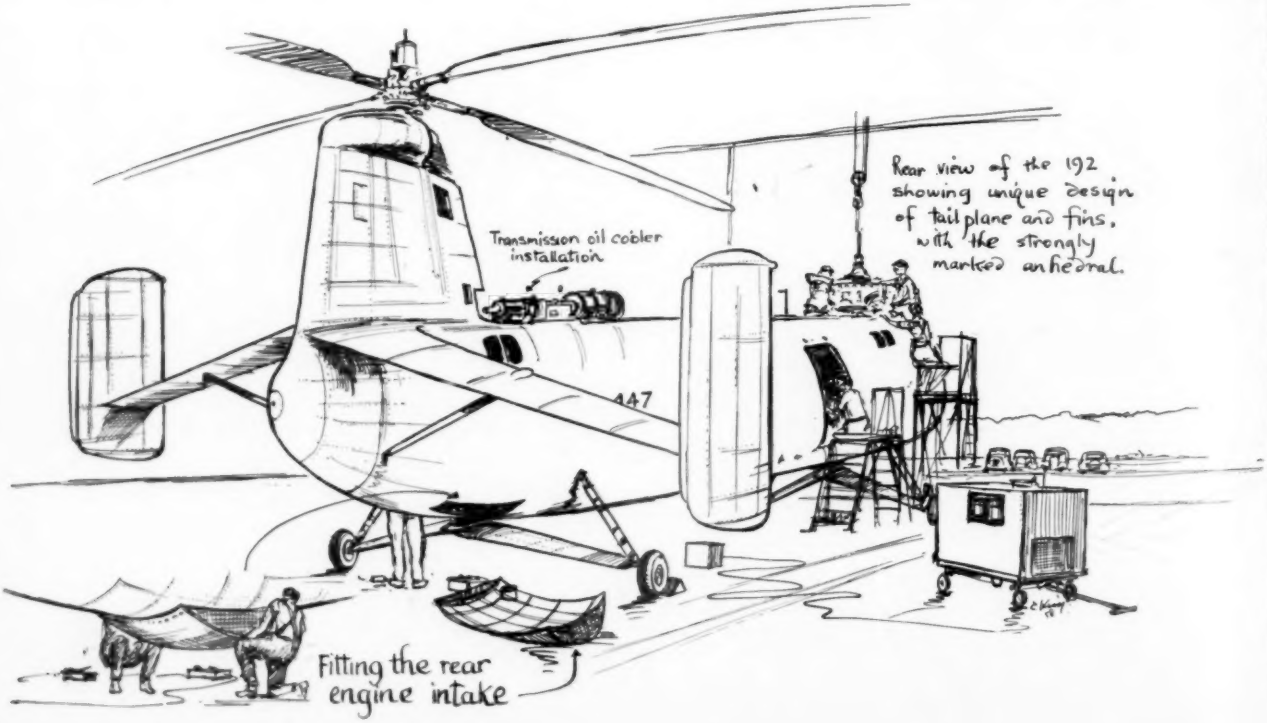
From the outset, however, the intention had been that the ultimate version of the 192 should be turbine-powered by Napier Gazelles and, in course of time, the relatively rapid development of these powerplants made it possible to dispense with the interim piston-engined version altogether and to go straight to the turbine version. This then was the aircraft that flew for the first time on July 5.

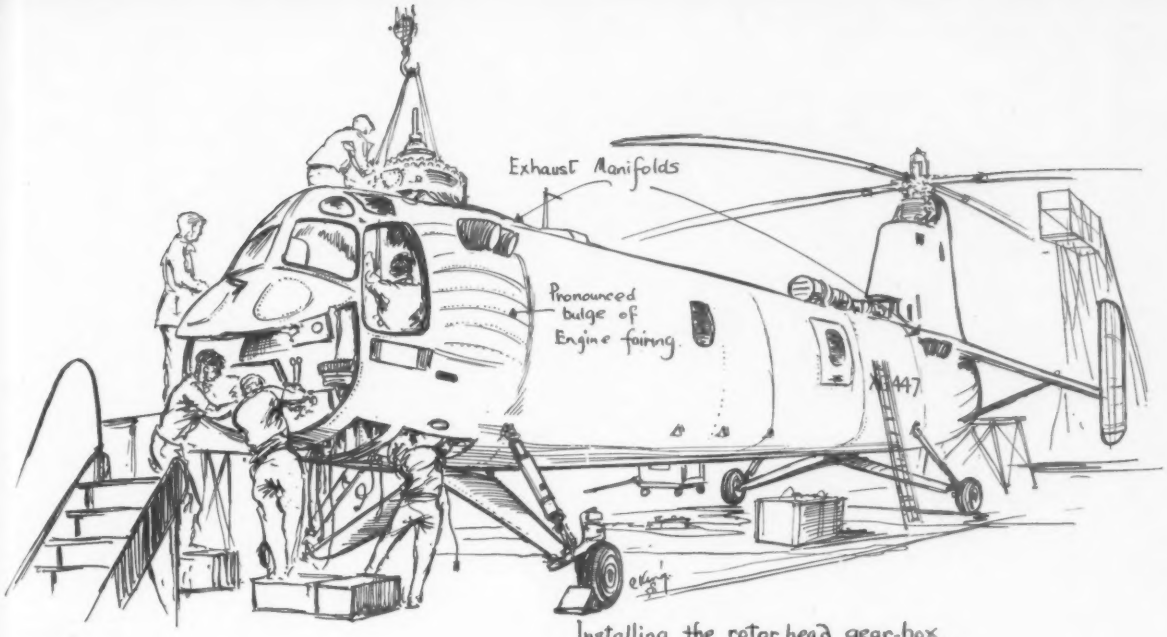
Here, perhaps, it is useful to recapitulate briefly the basic arguments in relation to gas-turbine powerplants for helicopters with particular reference to the 192. There are, of course, certain characteristics of turbine engines which commend themselves equally to the designers of fixed-wing aircraft—for example, their smaller bulk generally makes for a simpler and lighter overall installation. For a helicopter layout, such as that of the 192, where the powerplants are located within the fuselage, this compactness has the added advantage of providing greater accessibility for installation and maintenance. The virtual absence of vibration is likely to be reflected in greater reliability of the powerplant and transmission system.

More important, however, to the helicopter is the fundamental advantage offered by the turbine engine's high power/weight ratio. It has in fact been said that the installed specific weight of the gas turbine is only about two-thirds that of the equivalent piston engine.

This high power/weight ratio is of particular importance in a multi-engined helicopter for which an adequate performance with one engine failed during take-off or en-route cruising is particularly important. To ensure such performance with piston engines would demand large (and, therefore, heavy) powerplants and in consequence give substantially reduced payloads. In this connection, too, the ability of the turbine engine to run for short periods well above its normal maximum power is a tremendous advantage. For example, according to Bristols, to provide for engine failure at take-off a rating of 1.8 times the maximum power needed for normal flight is available for a short period from the Gazelle. This power can be used for up to 2½ min. In the case of the en-route failure, 1.4 times the maximum normal power would be available from the "good" engine and could be used for up to 1 hr.

An essential part of the preliminary proving and development programme for a new helicopter is the test-rig running of the transmission and rotor-head systems. In the case of the Bristol 192 this has been catered for by test-rig airframes suspended in a gantry by means of which the steady flight loads, gearbox and transmission loads can be simulated. By suspending the airframe in the gantry from its rotor hubs, the structure is subjected only to normal flight loads and the hub operating conditions are reproduced more accurately. (In the earlier form of helicopter ground running, it was usual for the airframe to be lashed down to prevent it lifting; and with the powerplant developing full power, the blades needed to be in coarse pitch to avoid over-speeding. This meant that the loads


Rear view of the 192 showing unique design of tail plane and fins, with the strongly marked anhedral.
Transmission oil cooler installation
447
Fitting the rear engine intake



Drawings copyright "The Aeroplane."

Installing the rotor head gear-box, and wiring system in the Bristol 192

put into the hub and associated structure were much greater than the normal flight loads and were, therefore, by no means representative.)

Three twin-rotor rigs for "suspended" running have been built by Bristol. The first was a relatively simple one, used primarily for Type 173 transmission and gearbox development. It comprised a straightforward pair of gantries which were only large enough to permit test fans and dummy hubs to be fitted to the airframe. Adjustment of drag plates on the fan arms was used to simulate pitch changes and enabled the powerplant to be run at any required power and r.p.m.

Two more refined gantry rigs were later built for Type 192 development. These were large enough for complete blades to be installed and can be used for control and blade testing as well as general powerplant, gearbox, transmission and hub development. Power is provided by two 1,650-s.h.p. Gazelles. The first rig was operated from the cabin in the actual airframe, but the second and third have separate control caravans which, by virtue of a remote control system, will make endurance running a much simpler—and more pleasant—operation for the test-rig crew.

General Layout and Structure

Structurally the Bristol Type 192's fuselage is a straightforward semi-monocoque closely following the general design of its predecessor the 173 (which was described in detail in THE AEROPLANE for March 16, 1951). Over the main cabin portion between the front engine bay and the forward fin frame, it has a constant ovoid cross section. The cabin proper is 24 ft. 1 in. long by 5 ft. 3 in. wide by 4 ft. 11 in. high. There is a crew entrance door on each side of the extreme nose and a main cabin entrance door about halfway down the starboard side of the fuselage. This door measures 50 in. by 54 in., is hinged at the top and is jettisonable.

At the top and bottom of the fuselage, the skin and frames are indented to form ducts which are closed by external quick-release panels. The upper duct houses the synchronizing-shaft connecting the rotor hubs, and the control rods; these are carried in bearings located in light-alloy castings bolted through the main frames. The lower duct is used for such things as electrical leads and other similar services.

Two main bulkheads in the forward part of the fuselage separate the front fuel-tank bay from the cabin and from the forward engine compartment. The forward one of these two units also forms a fuselage transport joint and, together with an auxiliary bulkhead below the cabin-floor level, takes the landing loads from the front undercarriage unit into the airframe. A third structural bulkhead is located between the engine compartment and the cockpit; it is connected at the top by means of two longitudinal beams to an arch frame. This structure has bolted to it a rotor attachment forging and transmits the front rotor loads into the airframe.

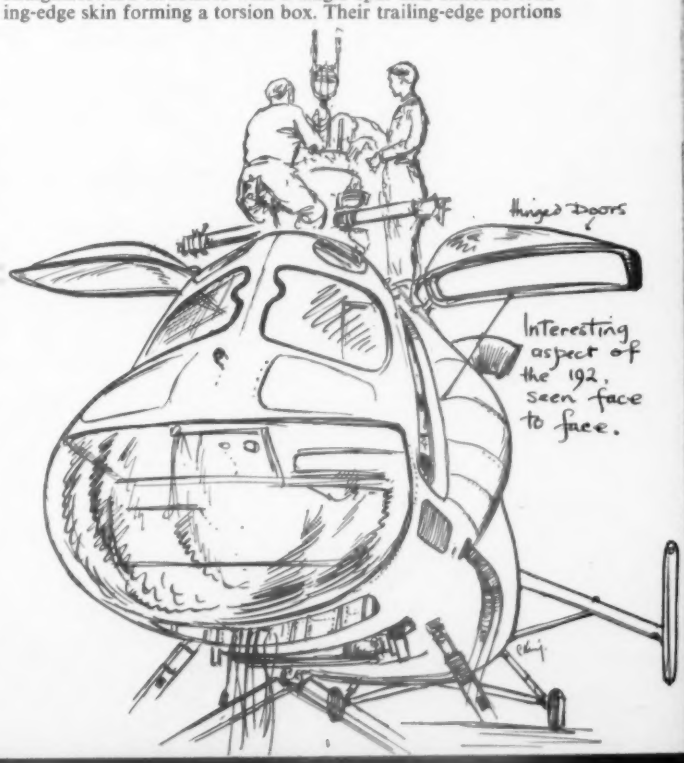
These three front bulkheads each have an opening in them on the port side to provide a passageway for access to the cabin from the cockpit. This passageway is bounded on the port side by the fuselage skin and on the starboard side by removable panels enclosing the engine compartment. The rearmost bulkhead opening is closed by a door.

A pair of fore and aft keel members, together with the engine-compartment bulkhead structure, form the main load-carrying unit for the front powerplant. These keel members are, in fact, extended forward to provide the principal support for the cockpit-floor members and cross frames.

At the rear of the fuselage there is a similar arrangement of bulkheads, but here there is one fuel bay located forward of the rear engine compartment and a second one aft of it. The forward fuel-bay bulkheads carry the rear undercarriage unit.

The vertical tail fin is an integral part of the rear fuselage and forms a mounting for the rear rotor hub and gearbox. Rotor loads are, in fact, taken into the main airframe structure through the three fin spars and their skin which form, in effect, a sturdy built-up box unit. The hub is carried on the top of this unit by means of a large forged fitting similar to that used for the front rotor head.

Light fairings form the leading- and trailing-edge portions of the fin, and the leading edge is removable to give access to the rear rotor control rods. The tailplane and endplate fins are straightforward structures with a single spar and stiffened leading-edge skin forming a torsion box. Their trailing-edge portions



Interesting aspect of the 192, seen face to face.

are built up with light diaphragm ribs, and at the tailplane root end there is a short auxiliary spar.

Designed for a normal vertical velocity absorption of 8 ft./sec.—and 12 ft./sec. in an emergency—the four-wheel undercarriage of the 192 has a track of 10 ft. and a wheelbase of 30 ft. Each of the four units has an inclined shock absorber leg and a radius rod in the form of a built-up torsion box. As a means of avoiding ground resonance and to permit the helicopter to land on a slope with greater ease, swinging links, attached to a damper unit, couple the inboard ends of each pair of radius rods so that the aircraft is free to roll about its principal inertia axis, but is suitably restrained by the damper unit. All four wheels are provided with hydraulically operated brakes and each axle has a towing spool with a permissible load of 3,000 lb. The front wheels are fully castoring; the rear pair are fixed directionally.

As we have said, the two powerplants are mounted in compartments at each end of the cabin. Both are in the upright position, the front engine inclined forward about 7° and the rear engine backward at 15°. Each engine bay serves as a plenum chamber into which the major proportion of the air comes from an underside intake; some air is, however, taken in higher up to pass over and cool the gearboxes.

Large access hatches are provided in the underside of the fuselage, under the engine compartments, through which the powerplants can be installed and serviced. Each engine is contained in a titanium fireproof cowling and is provided with a BTH iso-propylnitrate starter system which can give six starts.

A total fuel capacity of 560 Imp. gal. is provided by the three tanks, each of which is of the bag type located in a light-alloy frame. Half this fuel is carried in the front tank which normally supplies the front engine. Similarly, the rear engine is normally supplied by the two rear tanks which each hold 140 gal. A cross-feed system is, however, installed so either engine can be supplied by all tanks.

There is an immersed fuel pump in the bottom of the forward tank which feeds the high-pressure pump on the forward engine. For the rear powerplant the high-pressure pump is supplied by an immersed fuel pump in a collector box fed by both rear tanks. The fuel system includes arrangements for jettisoning in an emergency and all fuel except 140 gal. can be dumped. The front tank and the forward of the two rear tanks jettison through a pipe in the starboard shock-absorber leg fairings and the rearmost tank through a pipe underneath the rear fuselage.

The free turbine shaft of the forward engine is coupled direct to the main rotor gearbox, which is a two-stage spur-gear unit giving an overall r.p.m. reduction of 12 : 1 for the rotor. From this front gearbox the synchronizing shaft is driven by a spiral bevel gear at 1.2 engine speed and connects up with the rear rotor shaft through an intermediate gearbox on the free turbine shaft of the rear engine at the base of the fin. At the top of the rear rotor shaft is the rotor gearbox proper which, like the front unit, gives a 12 : 1 reduction; in this case, however, this is obtained by one spur-gear stage and one spiral-bevel stage.

A hydraulic rotor brake is located on the synchronizing shaft just aft of the coupling into the front gearbox. This brake can bring the rotors to rest from 100 r.p.m. in 16 sec.

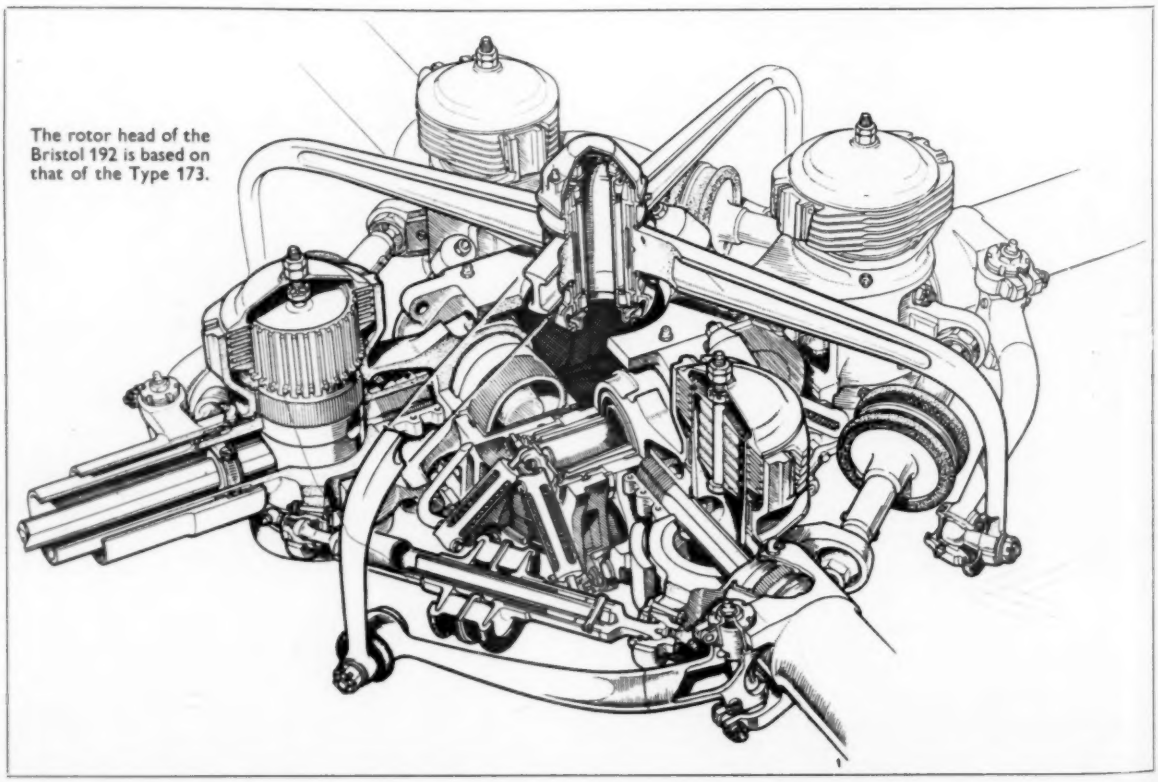
Men at work.

A lightning sketch during the fitting of the rotor-hub to the front gear-box.

At the top of the intermediate gearbox there is a small auxiliary gearbox which drives two 4-kW. 28-V. DC generators and two 9-kVA. 208-V. 400-cycle alternators. Oil for the three main gearboxes is supplied by a triple oil pump driven from the intermediate gearbox. This oil comes from a separate 6-gal. tank and is returned from the front gearbox by scavenge pump and from the rear gearbox by gravity drain. Also in the intermediate gearbox is a cooling-oil pump which circulates oil through a cooler-unit on top of the fuselage; the oil-cooler fan is driven from the auxiliary gearbox.

Rotor hubs and blades for the Bristol 192 are similar to those used in the earlier Type 171 and Type 173. Needle-roller flapping hinges are mounted in the hub forging close to the axis. From these, short links carry the drag hinges to which the blades are connected by means of concentric sleeves. The blade itself is actually mounted on the outer sleeve which can rotate on the inner one with the bending loads catered for by a light needle-roller bearing. Inside the inner sleeve there is a tie rod—split into eight segments to reduce its torsional stiffness

(*Continued on page* 171)



The rotor head of the Bristol 192 is based on that of the Type 173.

(*Continued from page* 170)

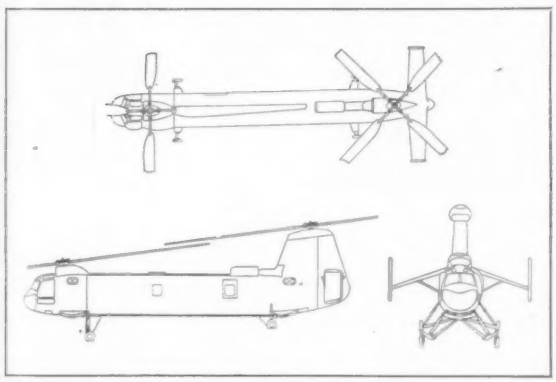
and reduce pitch-changing loads—which carries the centrifugal blade loads.

Friction dampers are fitted to the drag hinges and rubber buffers are provided between the blades to prevent excessive relative movement during starting and stopping operations. To avoid excessive blade droop at low rotational speeds the hub is fitted with centrifugally operated droop stops.

Initially the blades for the 192 will be the familiar Bristol wooden ones. Constant-chord light-alloy blades are, however, undergoing development and it is proposed that these will later be offered as an alternative.

Blade control is effected by a hub spider which is connected to the blade lever arms on the outer root sleeves. This spider can be tilted by a cyclic-pitch control axle the lower end of which is moved fore and aft or laterally by the azimuth and yaw-control systems. The ball joint which permits this rocking of the spider axle is held in a sleeve forming the main collective-pitch connection, so that upward or downward movement of the sleeve—and hence the spider axle—results in collective-pitch change movement of the blade levers.

Cockpit controls are orthodox. The collective-pitch lever is, however, linked to the engine controls in such a way that the rotor speed remains sensibly constant as collective pitch is altered. Fore-and-aft movement of the cyclic-pitch control tilts the rotors in the usual way, but there is a mixing linkage in the system which adds in a differential collective-pitch change to avoid longitudinal trim changes. Sideways movement of the cyclic stick tilts the rotors in a similar way for lateral control, while rudder-pedal movements give equal and opposite lateral tilts to the two rotors, so producing the required directional turning couple.



General arrangement of the Bristol 192.

The flying controls are capable of being operated by an autopilot operating the longitudinal cyclic, lateral cyclic and yaw controls through three electric servo-motors. Provision has also been made in the 192 for a homing and approach aid coupling into the autopilot system. And if the customer requires it fully duplicated power controls will be fitted as an alternative system to the present standard manual control system.

As we said earlier, the Bristol 192 can be used for a number of different rôles. For communications work, for example, it is equipped with 18 seats of the deck-chair type arranged to face inwards so that they can be folded against the cabin wall when not in use. For shorter-range operation four more seats can be fitted.

If required for freight carrying only the 192 can take a maximum distributed load in the cabin of 6,000 lb. Very bulky or awkward loads can be slung externally from a strong point under the fuselage, up to a maximum of 5,250 lb.

For ambulance duties normal accommodation is provided for a medical attendant and eight stretcher cases. With a smaller vertical distance between the stretchers, 12 can be carried; and if required two seats for sitting wounded can be added.

Twelve fully equipped paratroops and a despatcher are carried in the paratrooping version. For search-and-rescue work an aircrewman and 10 or more rescued persons, depending on the required range, can be accommodated; SARAH radio equipment and a low-level altimeter are standard equipment in this rôle. For anti-submarine patrol duties a crew of three or four is carried.

WORKROOM.—A roomy cockpit for pilot and co-pilot is provided. Controls are orthodox and the instrument lay-out conventional.

All in all, the new Bristol Type 192 promises to be a versatile craft which should prove to be a most useful addition to the R.A.F.'s specialized equipment. No figure for the number on order has been given, but it is known to be a reasonably substantial one for a machine of this size. And no doubt in course of time it will also be seen in civilian guise doing the sort of work for which a helicopter of this type is so eminently suitable.—F.T.M.

TECHNICAL DATA

Dimensions.—Rotor dia., 48 ft. 8 in.; overall length, 89 ft. 9 in.; distance between rotor centres, 41 ft. 1.25 in.; max. height, 17 ft.; min. rotor ground clearance, 6 ft. 11 in.

Weights.—Structure weight, 3,039 lb.; rotors and hubs, 1,899 lb.; powerplants, 3,571 lb.; fuel and oil systems, 382 lb.; fixed power services, 677 lb.; flying controls, 181 lb.; fixed equipment, 413 lb.; navigational and radio equipment, 319 lb.; crew (2), 360 lb.; oil, 72 lb.; basic operational weight with crew and oil, 10,913 lb.; max. all-up weight, 18,000 lb.

Performance.—Max. speed, 120 knots; representative cruising speed, 100 knots at 2,000 ft.; corresponding range with max. payload of 6,000 lb., 65 n.m., or with 2,600 lb. payload, 395 n.m.; hovering ceiling without ground effect, 8,000 ft.; service ceiling, 13,250 ft.

RUNNING-UP.—A busy shot of the first 192 running-up prior to making a flight. For helicopters in particular a useful characteristic of the gas-turbine powerplants is the short time needed to start and run up to maximum r.p.m.

Producing the Convair 880

In the course of a recent visit to San Diego, F. G. SWANBOROUGH *of* THE AEROPLANE *staff saw the Convair* 880 *jet transport in production. This article outlines the production sequence and describes special equipment and processes.*

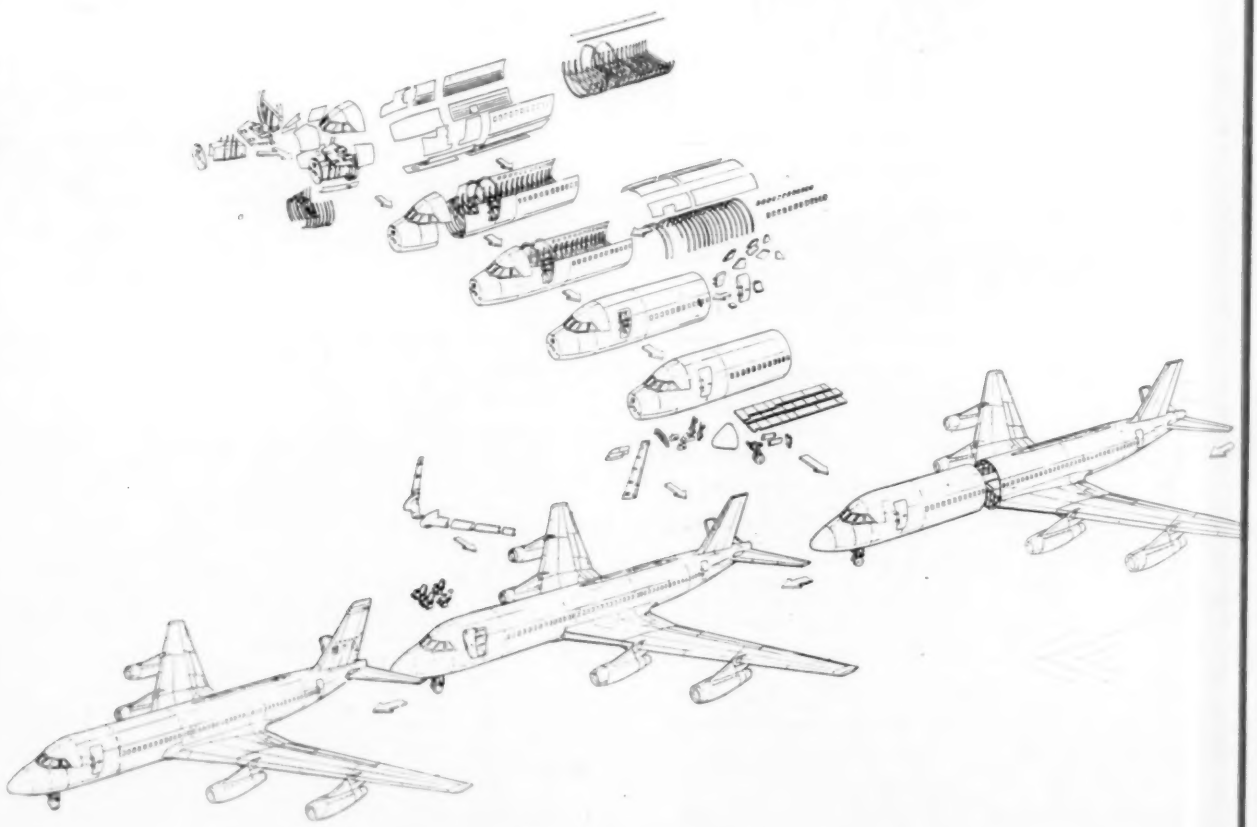
MAJOR ASSEMBLY of the Convair 880 began on April 10, when the wing fixtures or " bucks " were brought into use. Four days later work began on the first major fuselage section, and other assembly fixtures have been coming into use at intervals since then. The whole of Convair 880 production is located at Convair's Plant 1 in San Diego, in Building 1 (small components and Convair 440 spares), Building 2 (wings, rear fuselage, tail unit and major mating position) and Building 3 (forward fuselage and final assembly stages). In these three buildings until recently the Convair 440 was in production and the Convair Astronautics Division was doing some Atlas ICBM work also. Astronautics Division has now moved into a new facility for Atlas production and work on the 440 has ended (Convair have about 12 complete aircraft remaining for sale and the jigs have been moved up to Canadair's Montreal plant for production of the CL-66).

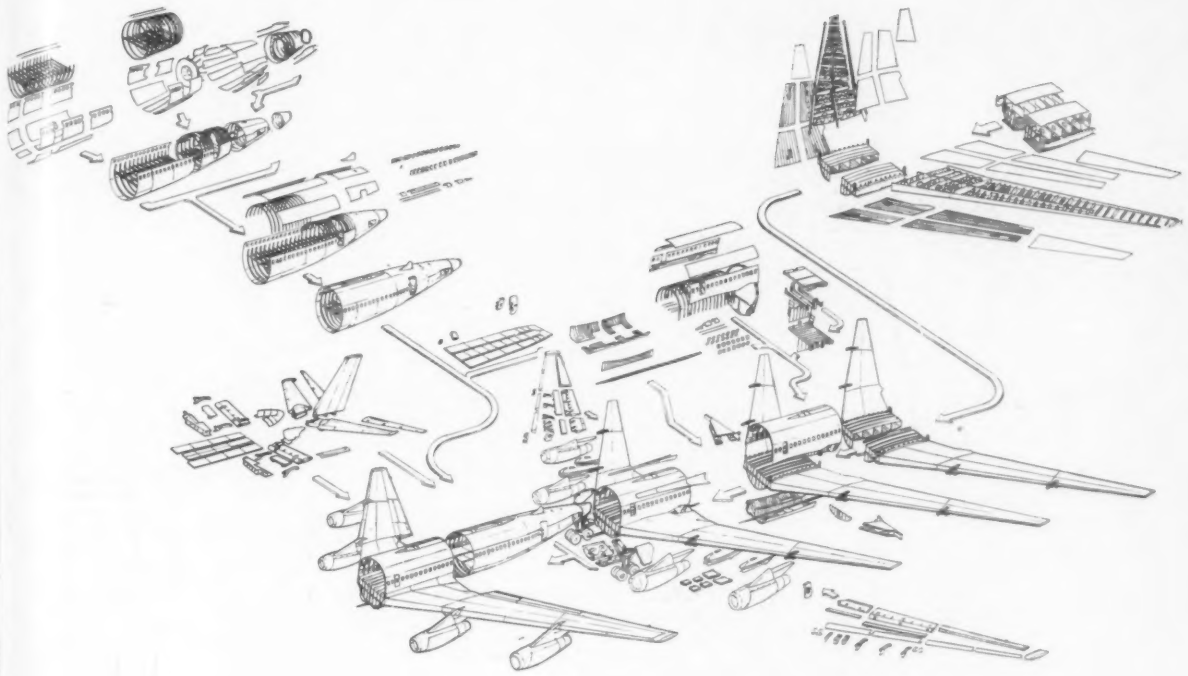
Detail design of the CV-880 (or Convair Model 22 as it is called on the works drawings) is now close to completion, and the engineering work force has dropped back to about 600. Some 2,000 are employed on production on the floor and this will rise considerably as the production rate builds up from one every three weeks at the start to a planned peak of six a month. Total investment in the project to date is of the order of $100 million, including $5 million for new machine tools and equipment, $10 million for engineering and $30 million for tooling.

The CV-880 is built up around the wing, in which the centre tie-box (half centre-section) is the key component. After assembly as a complete component, the centre tie-box has attached to it a steel locating plate, which then serves to locate the tie-box accurately (to .005 in.) in the vertical wing jigs. There are six of the latter, allowing work to proceed simultaneously on three sets, and this " triplication " is followed through most of the major fuselage component fixtures.

After the wings have been removed from the jigs and have undergone the Scotchweld sealing process—described later—the two halves are joined and then have added to them the fuselage over-barrel and under-canoe (completing the centre section) and the leading and trailing edges, engines, pods and undercarriage.

This complete wing assembly passes through the four stations on the final assembly or " mate " line to receive the aft fuselage and inboard trailing edges; the forward fuselage, stabilizers and inboard flaps; the final trim and rudder; and a pressure test before being rigged for flight.





The flow diagram above and on the opposite page illustrates the production sequence on the Convair 880. The key to the structure is the wing, which is itself built onto the centre tie box (top right corner). To the wing are added first the over-barrel, under-canoe, pods and undercarriage, then the rear fuselage and tail unit and finally the front fuselage and furnishing.

Among the new equipment installed by Convair for production of the CV-880 are a radial draw former, claimed to be the largest ever made; the largest aluminium heat-treat oven in the U.S. aircraft industry; the first aircraft sparmill to employ electro-hydraulic controls; five new Erco automatic riveting machines, and a new Scotchweld building.

The Cyril Bath radial draw former is used to produce fuselage belt frames, two of which together make up a 12-foot diameter ring. It has a 75-ton capacity tension ram and a 35-ton compression ram, and together with the heat-treat oven and a storage refrigerator is part of an $80,000 installation. The oven, by Despatch Oven Company, was designed to Convair specifications to handle aluminium extrusions up to 40 ft. in length, required for the belt frames.

In this oven, 75-S alloy extrusions are heated to 870° and are then quenched in the adjacent bath. They can be stored in the freezer, installed recently, until they are formed, after which the age-hardening process is completed at 320° for 24 hours. Complete fuselage frames are built up in vertical, rotating jig fixtures for ease of access.

Spar Miller and Riveter

The Onsrud spar miller came into use in April, and has a 36-in.-wide, 105-ft. bed and two carriages. One carriage has four horizontal heads (two with six axes and two with four) while the other has one horizontal and one vertical head, both with six axes. The electro-hydraulic control system is claimed to give superior finish, better speed and accuracy; the maximum speed is 300 inches per minute.

For the CV-880, this mill will produce wing spar rails, fuselage longerons and integrally stiffened skins. A typical job —the first for which the mill was used—is the 46 ft. lower keel longeron, which is a 310-lb. item milled from a 1,700-lb. aluminium extrusion.

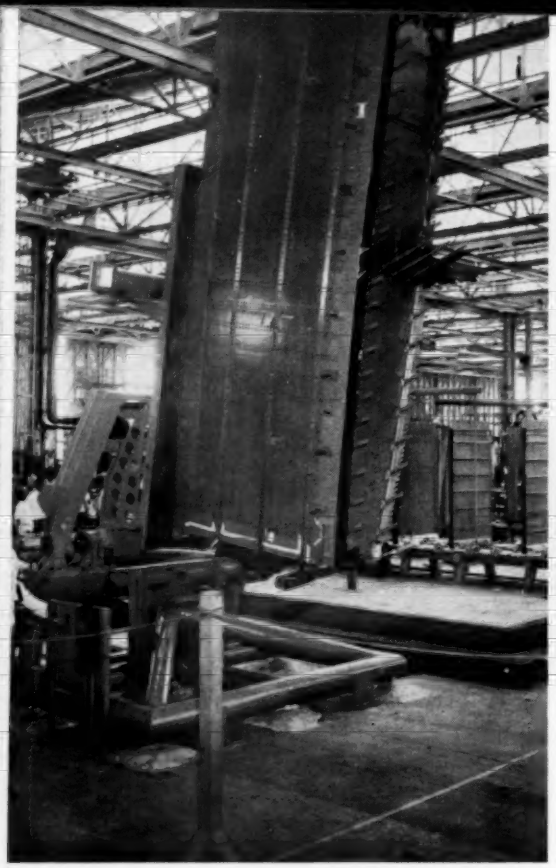
The first of the Erco riveting machines recently came into use. Developed jointly by Convair and Erco, they can be set up to locate, drill, countersink, rivet and broach automatically, as panels are fed along the work tables. These machines are to be used principally to add stringers to the fuselage and wing skins. A photograph of one of these machines and some pictures of CV-880 production appear on the next two pages.

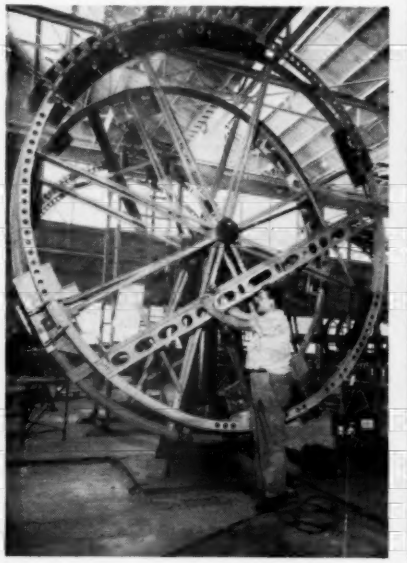
Convair experience with the Scotchweld process began with the F-102 delta-wing fighter and is one of many examples of the company's military experience being applied to the CV-880. The process is one which produces leak-proof, maintenance-free integral fuel tanks—according to the company, there is no case on record of a leak developing in an F-102. All parts included in the integral tank area have to go through a careful cleaning, priming and pre-curing process before assembly. During assembly, a film adhesive is inserted at all joints, and these produce a complete bond when the wings go into the electric oven after leaving the wing bucks.

To handle the priming and pre-curing, a new facility has been installed, with a series of treatment tanks and three drying ovens, each large enough to handle the largest wing skins used in the CV-880.

Before starting work on the first 880, Convair proved out the assembly fixtures in the construction of a metal mock-up, with a complete fuselage and one-half wing. This mock-up, which is not to be confused with a functional mock-up and has no operating systems, is now being used to work out the exact location of electric wiring, tubing, cables and other equipment. It will continue in use for training personnel and to work out design changes.

Convair had the first two wings ready for Scotchweld curing by mid-June, and expect to have this aircraft on the final mating line by October. Roll-out is scheduled for the end of December and first flight a month later. The third aircraft will be used for structural testing, before completion and delivery, and an additional fuselage and stub-wing will be built between the fourth and fifth production aircraft, to be used in a water tank fatigue test.



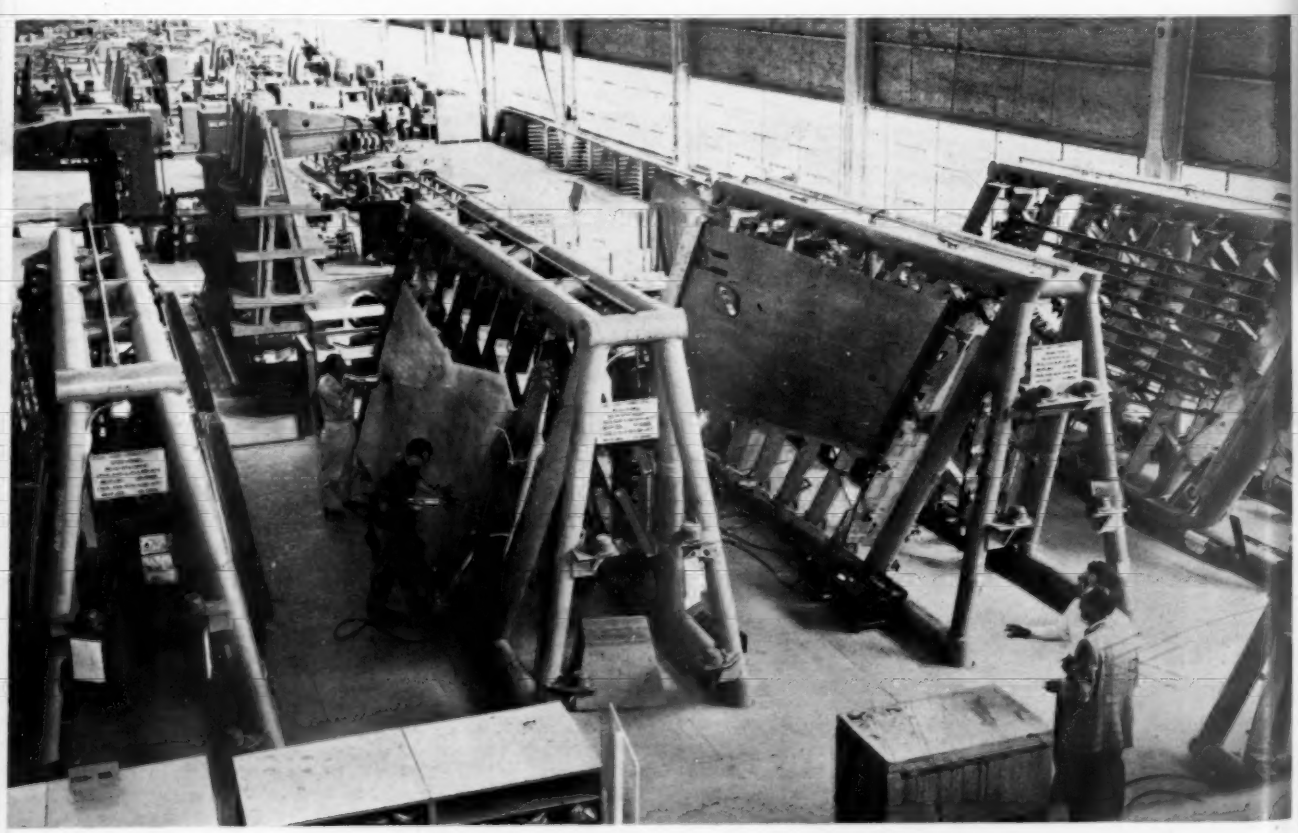


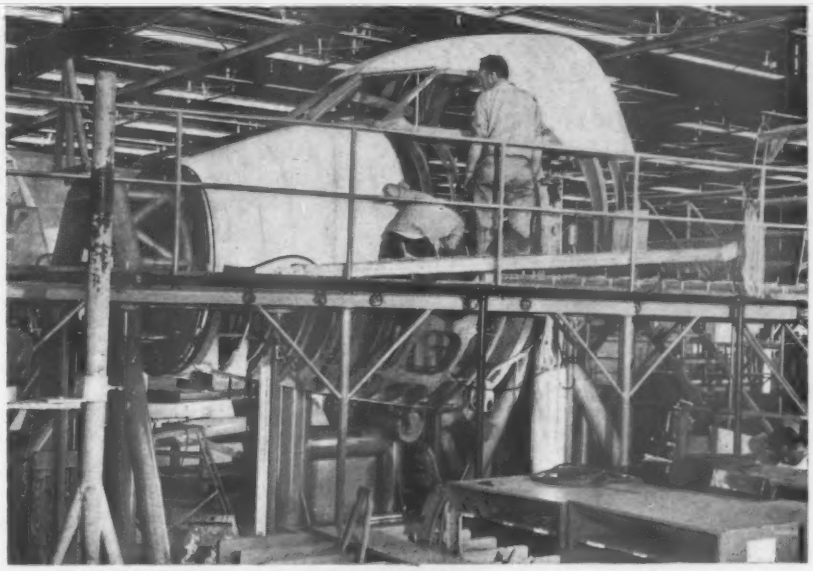
Above, complete fuselage frames are built up in these vertical, rotating jig fixtures for ease of access.

Left, a steel locating plate, visible here, is attached to each wing centre tie box to locate it accurately in the vertical wing "buck" or jig.

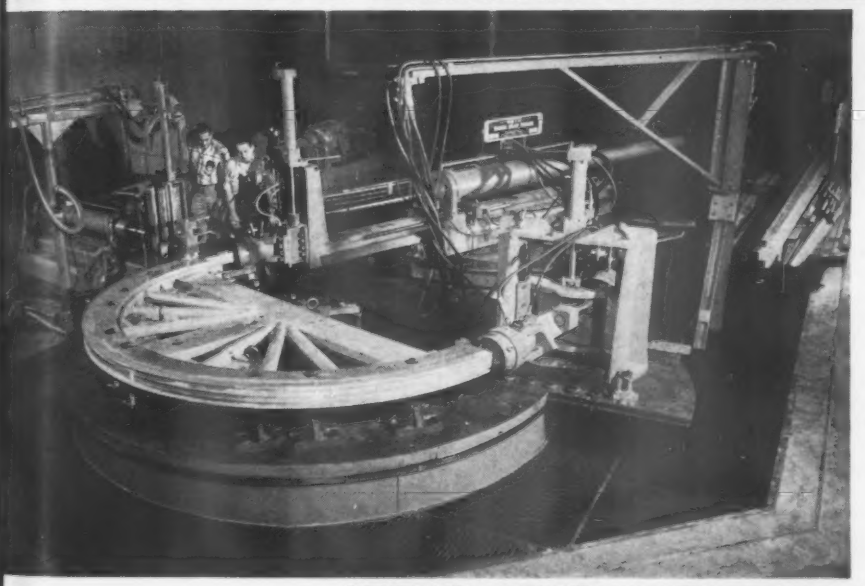
Above, one of the Erco automatic riveting machines which have been developed to Convair requirements for use on wing and fuselage panels. Five are to be used in all—three for wing panels and two on fuselage work.

Convair 880 Production





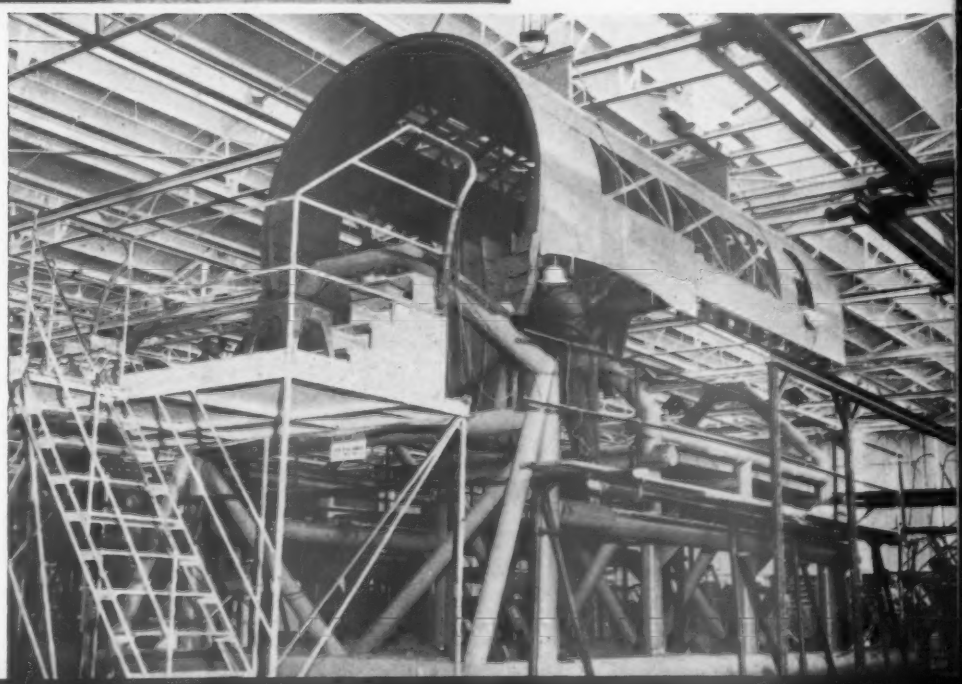
Above, the nose section of the first CV-880 takes shape in its assembly jig. There are three of these fixtures, in common with the "triplication" of most of the assembly jigs.



Left, this radial draw former, made by Cyril Bath for Convair, is claimed to be the largest in the world. It has a 75-ton pull and is used to produce fuselage belt frames and other parts.

Left, work in progress on wing panels. In these fixtures, skins and stringers are riveted together. The assemblies then go into the vertical wing "bucks" to be built up into complete half wings.

Right, a fuselage over-wing barrel. This sits on the wing centre section, the fuselage form at this point being completed by an under "canoe."



Tests for a Freighter

Preparations for launching the Armstrong Whitworth A.W.650 Argosy freighter into World markets include an extensive programme of structures testing. Some aspects of this were touched upon in our issue for May 30, but a fuller account is necessary to do justice to this important work.

TIME is all-important with a new aeroplane in these highly competitive days, and Sir W. G. Armstrong Whitworth Aircraft, Ltd., plan to fly the first Argosy before the end of this year—less than two years after the start of detail design. To this end, the structures-testing programme is proceeding at high pressure, and more than 75% of detail test work is complete.

Recently transferred to well-equipped and extensive new buildings at the company's Whitley design centre, the mechanical test laboratory is rapidly expanding its activities as production of the first 10 Rolls-Royce Dart-powered A.W.650 freighters gets under way.

The 60-ton Losenhausen tension-and-compression testing machine already in use for static testing is shortly to be supplemented by a 200-ton machine. Associated equipment includes pulsators; programme control units; and one 100-ton, one 50-ton and two 10-ton jacks for use with the pulsators. The entire installation will be functioning very soon.

There is a range of other testing machines including an Avery 45-ton horizontal static tension-and-compression machine for specimens up to 10 ft. long; a Riehle 6,000 to 60,000 lb. machine for vertical tension and compression; two Avery mobile units with various jacks of up to 100-ton capacity for static testing in rigs and frames; two 20-ton Avery Schenk pulsating fatigue machines; one 20-ton Losenhausen machine, and various smaller machines for both static and fatigue testing.

Equipment is available for simultaneous recording through 12 channels of dynamically loaded strain gauges or accelerometers. A 1,000-channel recorder has also been developed and this will be used to record loads from static strain gauges on teleprinter tape which can then be fed into a Ferranti Pegasus computer.

This A.W.A.-designed recorder balances and records two stations per second—just over 8 min. for a full run of 1,000 measuring points—which is considerably faster than existing equipment. It is possible to monitor selected gauges visually as well so that the test specimen progress at critical points is known immediately.

General testing with standard frames for component testing is done on a wide scale, and there is an extensive range of equipment for static- and fatigue-testing on components of all sizes and types. Tests have been made on bolted joints, engine mountings, panels with and without cut-outs, and so on.

Water-tank Testing

Although the state of the art of water-tank testing is now well known and the most important lessons have probably already been learnt, Armstrong Whitworths are taking no chances with their new aeroplane, and the major structures tests on the A.W.650 involve the use of water tanks.

Tank testing is not new to the company because an Apollo fuselage was fatigue-tested in a water tank in 1948. That tank at Baginton is not large enough to take a complete A.W.650 fuselage, but has been pressed into service for testing a 10-ft. long section of pressurized fuselage.

Two large new tanks are now being built on a universal testing site at Whitley, one for the fuselage structural strength test and the second for a complete airframe fatigue test. By using two tanks there will be no delay if the two test programmes overlap.

There is the additional and very practical advantage that for the main part of the fatigue programme the structural strength test tank will be available as a reservoir—the point being that each tank will hold about 150,000 gal. of water which would take about 30 hr. to supply from the mains, but this water can be transferred from one tank to the other in less than 2 hr.

As fatigue-testing will last for about two years this is a convenient means of quickly and regularly removing water for inspection of the specimen and rapidly refilling the tank again.

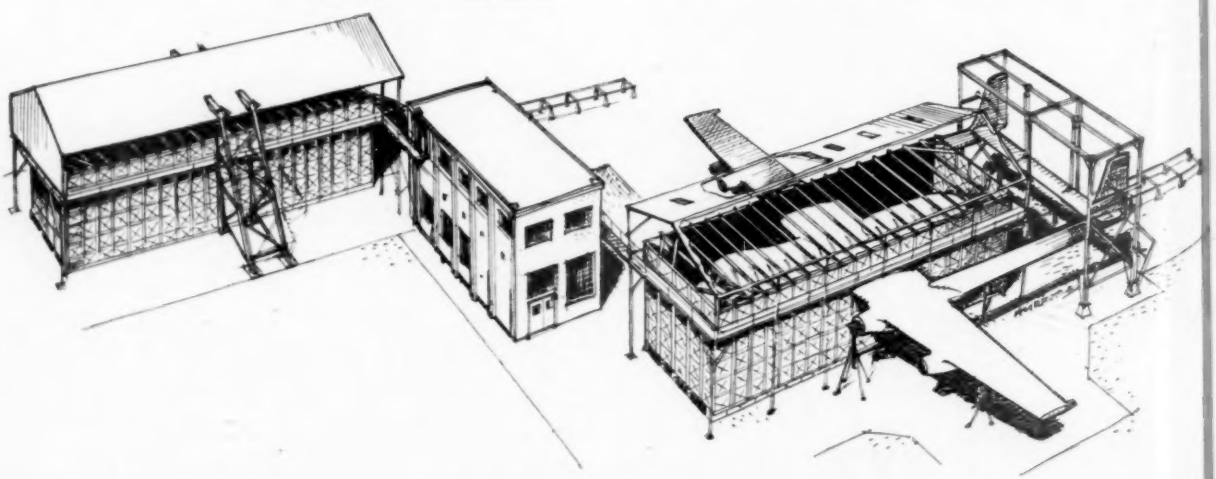
The two tanks are being built on a new site which has been laid out for ease of placing the specimens and for maximum convenience of the staff working on the tests and, what is even more important, extensions for future projects. The fuselage specimens will be moved into position from short rails laid end-on to the concrete bases of the tanks. The fuselage tank is being completed with one end open for loading of the specimen which will then be walled-in.

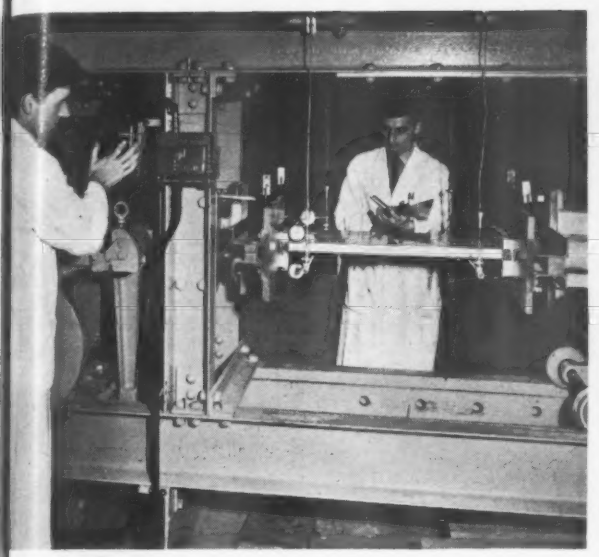
In the case of the fatigue-test airframe, the fuselage will be mounted on the tank base, the prefabricated steel tank panels added, and the remainder of the airframe—wings, tail booms and tail unit—attached outside the tank.

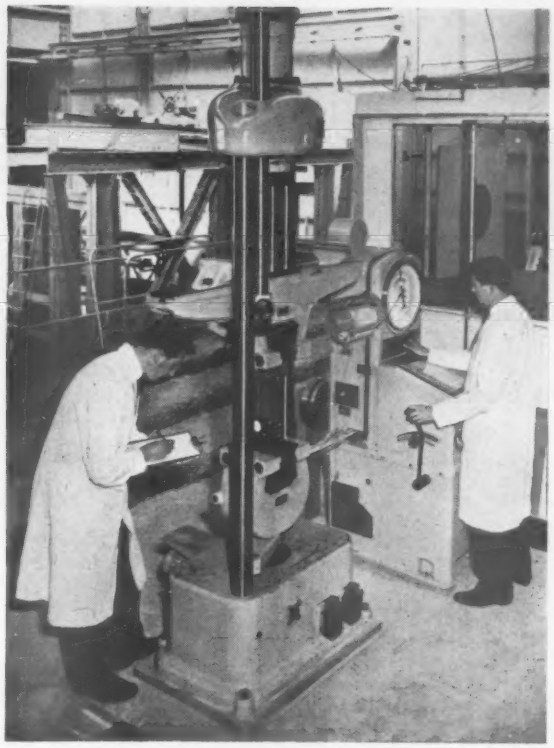
Loading to wings or wing pick-up points will be applied by hydraulic jacks and reacted through the floor by concrete

TRIAL BY TANK.—This drawing gives an impression of the Armstrong Whitworth water-tank testing site in its completed form.

"The Aeroplane" copyright drawing







LABORATORY TESTING.—A compression test, above, is being performed on a panel with Redux-bonded Z-section stringers. The machine is a 45-ton Avery.

Right, a floor panel and attachment of the Argosy crew cabin is put under tensile load in a Losenhausen 60-ton machine.

pressure piles along the centre of each tank, further piling being used where necessary to react high ground-loading.

Between the two tanks has been built a two-storey block of control rooms, housing water pump and hydraulic equipment on the ground floor with recording equipment on the first. The site is planned to allow for extension as needed for future aircraft designs. Tanks and pressure piling can easily be extended and the piling is at present in excess of immediate requirements for the A.W.650.

Testing Programme

Major structures tests at Armstrong Whitworth are under three headings—fuselage structure-strength test; combined wing, tail booms and tail unit static test, and complete aircraft fatigue test. As A. V. Roe and Co., Ltd. are sub-contractors for the wing and have suitable testing facilities, they are responsible for static testing of the mainplane.

The static strength test of the fuselage is to establish stress levels as an advance guide to fuselage fatigue life and by static testing—probably to destruction—to confirm the static strength of the fuselage under flight and ground loads. Static testing will include pressurization tests in the water tank. After completion of static testing, detail testing of the front and rear freight doors in the open position will be made with salvaged parts of the test fuselage.

At present it is not planned to do fail-safe tests with this specimen because the 10-ft.-section of fuselage is intended for this purpose. However, the water system for the static tank is such that simple cyclic pressurization tests are possible while fatigue tests are proceeding. Two other tests to be done on this specimen are the fuselage main flying-control circuit limit-load tests and a check on the ability of the control circuits to function while the fuselage is limit-loaded. A limited number of pressurization cycles will be done on this static specimen, before its proof loading and ultimate strength tests, to cover fatigue implications of prototype test flights.

Floor loads are reacted on a built-up " tree " structure inside the fuselage, the actual load being applied by four jacks at the main wing-to-fuselage attachments. Local bending loads are applied to the spar pick-up frames by additional smaller jacks to simulate the effect of wing bending. Nosewheel loads are applied by jacks to a dummy nose leg.

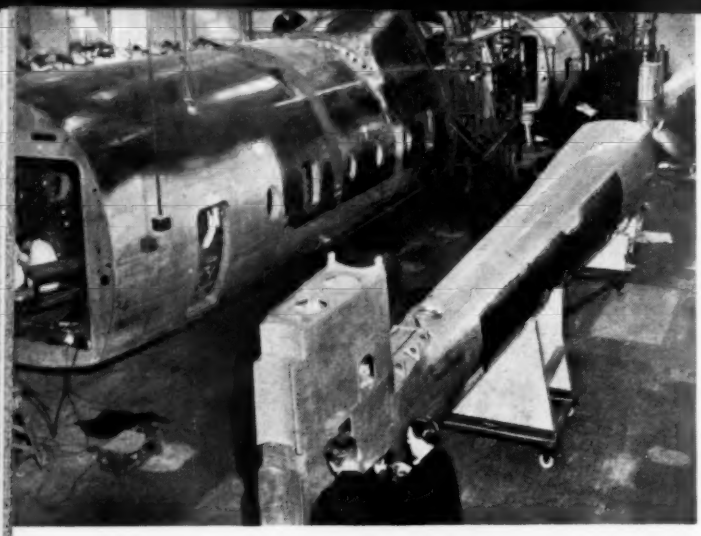
The principal object of the wing, tail booms and tail unit static tests is to confirm by static testing—again, probably to destruction—the static strength of these parts of the airframe under flight and ground loads. Also, it is intended to establish stress-levels as a guide to aircraft fatigue life.

To reduce testing time with the prototype aeroplane, stiffness tests on ailerons, tail booms, tailplane, elevator, fin and rudder will—so far as possible—be done on this test specimen. Three other tests to be made are the wing and tail boom main flying-control circuit limit-load tests; the aileron, elevator and rudder limit-load tests; and a check on the ability of the control circuits in wing and tail booms to function while the airframe is limit-loaded.

Establishment of the fatigue life of the complete airframe by means of a programmed fatigue loading is the object of the complete airframe fatigue test. It is not intended to do any detailed strain-gauging, although a limited amount of this will be done during the normal flight-cycle testing as a basis for the structural airworthiness flight-test strain-gauge location and interpretation.

The programme of fatigue loading includes pressurization, undercarriage loads and flight loads with gusts for both flaps-up

MOUNTING FATIGUE.—An engine mounting for one of the Argosy's four Rolls-Royce Darts is tested under tensile fatigue load on a 20-ton Avery pulsator machine.



SHAPES TO COME.—On the assembly line at Coventry are fuselages and tail booms of two of the first 10 Armstrong Whitworth A.W.650 Argosy turboprop transports.

and flaps-down, loads being applied to the tailplane, fin, wing, fuselage frames, nosewheel structure, engine mountings, flap hinge-ribs and so on. This test is more extensive than normal and should consequently permit a more accurate evaluation of fatigue life.

Other Investigations

Detail structures tests include stress-level investigations on the 10-ft. section of fuselage under pressure and floor loading. This specimen has shown satisfactory stress levels in the fuselage shell and around window cut-outs. It has been failed at 110% of the combined floor and pressurization design ultimate loads. Other work will involve testing to destruction of fuselage and tail boom compression panels in the 45-ton Avery machine to check skin buckling and stringer stability; pressure, concentrated load and wear tests on standard freight-floor panels to determine the best construction for a general panel.

Redux-bonded frame joints (which would otherwise have been forgings) have been tested for fatigue in the Avery Schenk machine; more than 60 tests have been made on typical stringer joints from various parts of the fuselage to check stress-distribution and life under various fatigue loadings, and X-ray photographs were taken of some panels to show failures not visible between the skin and frame section.

Other tests have been made on control-rod pressure seals; seat-to-floor rail attachments; standard frame joints; flexible control couplings; engine mounting joints, systems rig tests; a complete half fuel-system; a complete hydraulic system; the cabin conditioning system; model aerials; thermal de-icing airflows and temperature distribution; ditching trials and a number of tests on the electrical system including the Napier Spraymat de-icing of the tail unit.

Two interesting points can be singled out as typical of the detail testing work. Wear tests on the standard freight floor panels were made by leaving a panel in a gangway of the drawing office so that it experienced normal wear and tear. Armstrong Whitworth found, as Fokkers have done with a similar experiment, that Redux-bonded panels were far superior to riveted panels—a fact which was not apparent from the more classical methods of normal pressure and concentrated load tests.

The fuselage stringer-joint tests were of particular importance, because the design philosophy of the A.W.650 fuselage is to break stringers at each frame and to introduce a stringer joint at each frame with a bridging strap across the joint. The reason for this is that a fail-safe fuselage is required in which stringers and frames are both attached to the skin to provide as many alternative load-paths and crack-stoppers as possible. Examination of test results shows that this form of construction has at least typical fatigue characteristics with some added advantages.

There is a great deal of testing work going on at Armstrong Whitworth in connection with the A.W.650, and the tempo is increasing as airframe production proceeds and the date of the first flight approaches.

BANNER-TOWING BY PRENTICE

AT THE request of banner- and target-towing companies on the Continent, Aviation Traders, Ltd., have been studying the use of their civilianized Prentices for these duties, with considerable success. Tests have shown that the Prentice can offer better economy of operation when banner-towing than the Tiger Moth, which is restricted through performance limitations to a maximum height of about 500 ft. with a banner and must be flown continually at full power when towing.

Although the Prentice requires full throttle and maximum r.p.m. to meet the climb requirements with a banner, it may be cruised at the very economical power of −4 lb. boost with a towing speed of some 70 knots, and a fuel consumption of less than the Tiger's full throttle 10 gal. or so per hour. Towing ceiling is then 3,000 ft. or more, and the maximum operating speed with a banner about 100 knots.

The banners or drogue targets are picked up by the "snatch" technique, and the largest so far towed by the Prentice has been 8 ft. 6 in. deep by 57 ft. long. A simple steel-tube towing yoke with a standard Otfur hook has been fitted to the rear fuselage of the Prentice, and extended aft of the rudder so that no limitation is imposed on towing angles. For snatch pick-ups, a 40-ft. nylon rope is first secured to the hook and the free end with a weighted grapnel attached is stowed beside the pilot.

In its towing form the Prentice is basically a single-seater with the rear cockpit and dual-control fittings removed and radio and batteries installed next to the pilot. It then has a full normal transport category C. of A., with appropriate towing amendments.

After take-off the grapnel is released to trail below and behind the aircraft, to pick up a 40-ft. nylon loop between two 7-8-ft. poles. To the forward section of the loop, and stretching away on the grass in front of the poles, is laid the 200-ft. hemp rope for the banner or target, which is simply peeled off the ground after the grapnel has engaged the loop.

Pick-up speed must not exceed 70 knots if the banner is to be retained, and the aircraft is then climbed steeply away at full power and 62 knots without flap immediately after contact.

When banner-towing, 12½° of flap gives a better attitude and improves aileron control, but tests by J. R. Batt, who is responsible for the Prentice development programme, with an 8-ft. sleeve target on 100 yd. of line for target-towing have shown virtually no effect on performance. Spitfires, Meteors and Proctors are already used on the Continent by civilian target-towing operators, and as a replacement for the last-named machine the Prentice offers many advantages. Five hundred metres of line is required to be stowed in under-fuselage containers, but it is probable that a winch will be required for its extension and retraction.

Other developments of the Prentice under consideration include a five-seat version with single controls, and a projected eight-seater, for joy-riding.

Airships in Germany

ARISING out of a gathering of former Zeppelin men in 1956 a commission was appointed to investigate the possibility of reviving the large passenger- and freight-carrying airship from technical and economic standpoints. Among those who composed the commission were Capt. Pruss, Herr Hilligardt, and Chief Engineer Sauer.

Lord Ventry, who has recently visited Germany, deals with three reports which the commission has issued:—

The first report deals with a projected ship, the LZ.132, of 8,500,000 cu. ft., helium-inflated and driven by four 1,800-h.p. Diesel engines. With a total of 7,200 h.p. a speed of 100 m.p.h. is envisaged.

One hundred passengers would be carried inside the ship, as in the case of the R.100 and R.101, which, indeed, pioneered such an arrangement. A crew of 40 would initially be carried, including cooks and stewards; the number might be reduced with experience. It is estimated that an Atlantic crossing would take 48 hr. as against 168 hr. by liners from Bremen to New York.

If 35 round trips could be made in a year, with the airship two-thirds booked up, even one ship could operate at a profit.

The second report dealt with a possible airship freighter with the same characteristics as LZ.132 but rather slower. Her speed would be that of the "Hindenburg," which was 84.4 m.p.h., and meant an average of just under 75 m.p.h. over the North Atlantic.

Such an airship could carry 42 tons of cargo. At present rates, she would pay, provided that 21 tons could always be carried on each of the proposed 70 flights per year.

As such an airship could obviously carry much larger items than any aeroplane, there would seem to be no competition between the airship and aeroplane when employed as freighters.

The third report looked further ahead with a view to dealing with the threatened jet competition of the future.

In this case, a larger ship of 10,500,000-cu.-ft. capacity and 950-ft. length is envisaged. She would have a maximum speed of 100 m.p.h. for both passenger and freight carrying. Two hundred passengers would be carried in liner comfort and she would pay subject to similar conditions quoted for the airship in the first report.

As a freighter her payload would be 70 tons and here again, so long as 35 tons is always carried, she could operate at a profit. If, however, her speed was reduced to that of the "Hindenburg's" she could then carry 80 tons over the North Atlantic.

These reports naturally aroused much interest and Capt. Pruss, on a visit to Brazil, found much support; also, what was very important, the old Zeppelin shed at Santa Cruz is in good condition. The Brazilians well remember that between 1932 and 1937 they were able to cross to Europe and back again in four days each way in great comfort in the old "Graf Zeppelin" and the "Hindenburg."

There is also, of course, a certain amount of scepticism and opposition. Some believe, like the late Dr. Eckener, that the airship's day is over as a freight and passenger carrier. Others, who are perhaps more fully aware of all the latest technical advances made in the U.S.A., entirely disagree.

It is believed that not all who travel by air use the aeroplane because of its speed—some do, of course, and need this speed, but many do not. And airships could provide just as convenient a service as aeroplanes, with far greater safety.

Culdrose "at Home"

THE show on July 19 was opened in the presence of the Soviet Naval Attaché and glorious weather with the taxiing out from dispersal of a Balliol, 16 Gannets of the resident No. 796 Squadron (known as "The Pirates of Penzance," illustrated on the sub-fin), four Avengers of No. 831 Squadron and four AD-4Ws of No. 849. Simultaneously an ancient taxi, belching clouds of smoke and thunderflashes, tore down the track; ignoring "frantic" appeals over the loudspeaker to remove, it was then "attacked" by two Dragonflies and repulsed after being flour-bag "bombed."

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SHAPES TO COME.—On the assembly line at Coventry are fuselages and tail booms of two of the first 10 Armstrong Whitworth A.W.650 Argosy turboprop transports.

and flaps-down, loads being applied to the tailplane, fin, wing, fuselage frames, nosewheel structure, engine mountings, flap hinge-ribs and so on. This test is more extensive than normal and should consequently permit a more accurate evaluation of fatigue life.

Other Investigations

Detail structures tests include stress-level investigations on the 10-ft. section of fuselage under pressure and floor loading. This specimen has shown satisfactory stress levels in the fuselage shell and around window cut-outs. It has been failed at 110% of the combined floor and pressurization design ultimate loads. Other work will involve testing to destruction of fuselage and tail boom compression panels in the 45-ton Avery machine to check skin buckling and stringer stability; pressure, concentrated load and wear tests on standard freight-floor panels to determine the best construction for a general panel.

Redux-bonded frame joints (which would otherwise have been forgings) have been tested for fatigue in the Avery Schenk machine; more than 60 tests have been made on typical stringer joints from various parts of the fuselage to check stress-distribution and life under various fatigue loadings, and X-ray photographs were taken of some panels to show failures not visible between the skin and frame section.

Other tests have been made on control-rod pressure seals; seat-to-floor rail attachments; standard frame joints; flexible control couplings; engine mounting joints, systems rig tests; a complete half fuel-system; a complete hydraulic system; the cabin conditioning system; model aerials; thermal de-icing airflows and temperature distribution; ditching trials and a number of tests on the electrical system including the Napier Spraymat de-icing of the tail unit.

Two interesting points can be singled out as typical of the detail testing work. Wear tests on the standard freight floor panels were made by leaving a panel in a gangway of the drawing office so that it experienced normal wear and tear. Armstrong Whitworth found, as Fokkers have done with a similar experiment, that Redux-bonded panels were far superior to riveted panels—a fact which was not apparent from the more classical methods of normal pressure and concentrated load tests.

The fuselage stringer-joint tests were of particular importance, because the design philosophy of the A.W.650 fuselage is to break stringers at each frame and to introduce a stringer joint at each frame with a bridging strap across the joint. The reason for this is that a fail-safe fuselage is required in which stringers and frames are both attached to the skin to provide as many alternative load-paths and crack-stoppers as possible. Examination of test results shows that this form of construction has at least typical fatigue characteristics with some added advantages.

There is a great deal of testing work going on at Armstrong Whitworth in connection with the A.W.650, and the tempo is increasing as airframe production proceeds and the date of the first flight approaches.

BANNER-TOWING BY PRENTICE

AT THE request of banner- and target-towing companies on the Continent, Aviation Traders, Ltd., have been studying the use of their civilianized Prentices for these duties, with considerable success. Tests have shown that the Prentice can offer better economy of operation when banner-towing than the Tiger Moth, which is restricted through performance limitations to a maximum height of about 500 ft. with a banner and must be flown continually at full power when towing.

Although the Prentice requires full throttle and maximum r.p.m. to meet the climb requirements with a banner, it may be cruised at the very economical power of −4 lb. boost with a towing speed of some 70 knots, and a fuel consumption of less than the Tiger's full throttle 10 gal. or so per hour. Towing ceiling is then 3,000 ft. or more, and the maximum operating speed with a banner about 100 knots.

The banners or drogue targets are picked up by the "snatch" technique, and the largest so far towed by the Prentice has been 8 ft. 6 in. deep by 57 ft. long. A simple steel-tube towing yoke with a standard Otfur hook has been fitted to the rear fuselage of the Prentice, and extended aft of the rudder so that no limitation is imposed on towing angles. For snatch pick-ups, a 40-ft. nylon rope is first secured to the hook and the free end with a weighted grapnel attached is stowed beside the pilot.

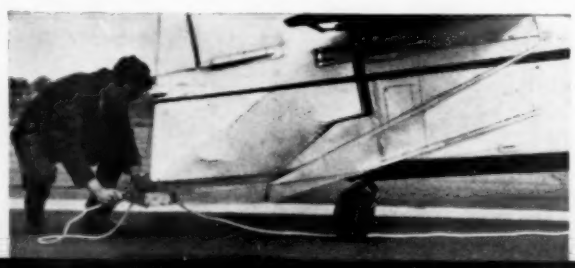
In its towing form the Prentice is basically a single-seater with the rear cockpit and dual-control fittings removed and radio and batteries installed next to the pilot. It then has a full normal transport category C. of A., with appropriate towing amendments.

After take-off the grapnel is released to trail below and behind the aircraft, to pick up a 40-ft. nylon loop between two 7-8-ft. poles. To the forward section of the loop, and stretching away on the grass in front of the poles, is laid the 200-ft. hemp rope for the banner or target, which is simply peeled off the ground after the grapnel has engaged the loop.

Pick-up speed must not exceed 70 knots if the banner is to be retained, and the aircraft is then climbed steeply away at full power and 62 knots without flap immediately after contact.

When banner-towing, 12½° of flap gives a better attitude and improves aileron control, but tests by J. R. Batt, who is responsible for the Prentice development programme, with an 8-ft. sleeve target on 100 yd. of line for target-towing have shown virtually no effect on performance. Spitfires, Meteors and Proctors are already used on the Continent by civilian target-towing operators, and as a replacement for the last-named machine the Prentice offers many advantages. Five hundred metres of line is required to be stowed in under-fuselage containers, but it is probable that a winch will be required for its extension and retraction.

Other developments of the Prentice under consideration include a five-seat version with single controls, and a projected eight-seater, for joy-riding.



Airships in Germany

ARISING out of a gathering of former Zeppelin men in 1956 a commission was appointed to investigate the possibility of reviving the large passenger- and freight-carrying airship from technical and economic standpoints. Among those who composed the commission were Capt. Pruss, Herr Hilligardt, and Chief Engineer Sauer.

Lord Ventry, who has recently visited Germany, deals with three reports which the commission has issued:—

The first report deals with a projected ship, the LZ.132, of 8,500,000 cu. ft., helium-inflated and driven by four 1,800-h.p. Diesel engines. With a total of 7,200 h.p. a speed of 100 m.p.h. is envisaged.

One hundred passengers would be carried inside the ship, as in the case of the R.100 and R.101, which, indeed, pioneered such an arrangement. A crew of 40 would initially be carried, including cooks and stewards; the number might be reduced with experience. It is estimated that an Atlantic crossing would take 48 hr. as against 168 hr. by liners from Bremen to New York.

If 35 round trips could be made in a year, with the airship two-thirds booked up, even one ship could operate at a profit.

The second report dealt with a possible airship freighter with the same characteristics as LZ.132 but rather slower. Her speed would be that of the "Hindenburg," which was 84.4 m.p.h., and meant an average of just under 75 m.p.h. over the North Atlantic.

Such an airship could carry 42 tons of cargo. At present rates, she would pay, provided that 21 tons could always be carried on each of the proposed 70 flights per year.

As such an airship could obviously carry much larger items than any aeroplane, there would seem to be no competition between the airship and aeroplane when employed as freighters.

The third report looked further ahead with a view to dealing with the threatened jet competition of the future.

In this case, a larger ship of 10,500,000-cu.-ft. capacity and 950-ft. length is envisaged. She would have a maximum speed of 100 m.p.h. for both passenger and freight carrying. Two hundred passengers would be carried in liner comfort and she would pay subject to similar conditions quoted for the airship in the first report.

As a freighter her payload would be 70 tons and here again, so long as 35 tons is always carried, she could operate at a profit. If, however, her speed was reduced to that of the "Hindenburg's" she could then carry 80 tons over the North Atlantic.

These reports naturally aroused much interest and Capt. Pruss, on a visit to Brazil, found much support; also, what was very important, the old Zeppelin shed at Santa Cruz is in good condition. The Brazilians well remember that between 1932 and 1937 they were able to cross to Europe and back again in four days each way in great comfort in the old "Graf Zeppelin" and the "Hindenburg."

There is also, of course, a certain amount of scepticism and opposition. Some believe, like the late Dr. Eckener, that the airship's day is over as a freight and passenger carrier. Others, who are perhaps more fully aware of all the latest technical advances made in the U.S.A., entirely disagree.

It is believed that not all who travel by air use the aeroplane because of its speed—some do, of course, and need this speed, but many do not. And airships could provide just as convenient a service as aeroplanes, with far greater safety.

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NEWS OF INDUSTRY

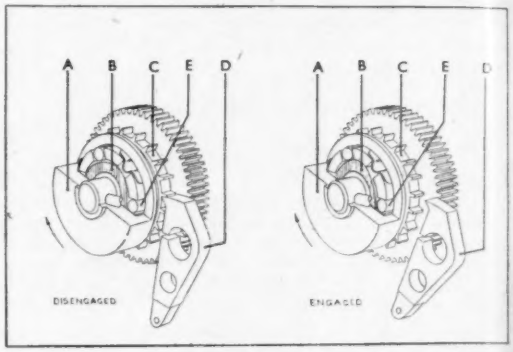
Tiltman Langley Roller Clutch

A SMALL roller clutch has been produced by Tiltman Langley, Ltd., of Redhill Aerodrome, Surrey, intended for use on mechanisms where robustness is a primary requirement. The clutch can be controlled either mechanically or electrically and the control pawl can be operated by a 17-W. solenoid. The clutch will transmit about ½ h.p. at speeds around 1,500 r.p.m. It is said to be unaffected by operation in tropical or very cold climates.

Main components of the clutch are shown in the diagram. They are the housing (A), which is the driving member; a cam attached to the output gear (B); a control wheel combined with a roller cage (C); a pawl (D) and rollers (E). In the first sketch the clutch is disengaged; the control wheel and roller cage are held stationary by the pawl and the rollers are prevented from being driven into the wedge formed by the housing and cam.

If the control wheel is released, as in the second sketch, it moves clockwise because of the friction of the springs and the rollers are driven into engagement and the drive is transmitted to the output gear. When the pawl engages the control wheel the rollers are kicked out of the locked position and the clutch is disengaged.

To suit different installations or to give rotation in the opposite direction the pawl and solenoid can be mounted in a variety of ways. The clutch can be supplied with a range of standard gears. Its price is £6 15s.



The roller clutch assembly by Tiltman Langley, Ltd., which is referred to alongside.

High-speed Machining

FOLLOWING the industrial trend to segregate specialized technology and processes, Routing, Ltd., which is believed to be the only firm engaged exclusively in the production of metal components by high-speed machining, has been established at Feltham, Middx. An associate company of Morfax, Ltd., of Mitcham, it has been developed from the original routing department of the parent company, where routing work and tooling have been in progress for the past four years.

The new company at present has some 20 Wadkin routing machines of various types, including a twin-operated skin-milling machine which can handle light-alloy plates from 6 ft. wide to an unlimited length, and one machine fitted with hydraulic depth control. Supporting this installation are machines to handle tooling and templates manufactured for the routing production line, and an inspection department.

As sub-contractors to a number of aircraft manufacturers, Morfax received requests for the economic production of experimental machined components from the solid, and in 1953 set up an experimental routing shop at Mitcham. The company set about increasing the depth of cut that could be made in one pass of the cutter and produced a head which cuts to a depth of 3 in. in light-alloy material. In co-operation with Wadkin, Ltd., manufacturers of the routing machines, equipment capable of cutting to a depth of 6 in. or more was developed.

Other applications of the process have been the development of skin-milling for aircraft and similar highly stressed sheet components. Examples of this include 12 ft. 4 ft. by ¼-in. thick sheets which have been routed down to .08 in. over the thinnest areas. Other skins have been reduced from the same thickness to .023 in., demonstrating the degree of control now possible with this process.

The experimental department for Routing, Ltd., has been retained at the Mitcham works of Morfax, where present work is in progress in connection with the routing of titanium and high-tensile steel alloys under a Ministry of Supply contract. At Feltham, a new 18,000-sq.-ft. factory building is being built and nine more routing machines are on order.

A bulkhead in high-tensile aluminium alloy machined by Routing, Ltd., from the solid billet. The original billet weighed 23 cwt.; finished components weighed 8¾ cwt.

Pneumatic Hand Tools

AMONG the various aircraft and other activities of Sir W. G. Armstrong Whitworth Aircraft, Ltd., at Coventry, are the development and production of pneumatic hand tools. Examples of these are hand saws and a milling tool.

Two models of pneumatic hand saw are available, one working at 2,500 r.p.m. and the other at 4,500 r.p.m. Thickness limits of material to be cut are ⅜-in. for light alloy, ¼-in. for mild steel and ⅛-in. for gauge steel. The saws are particularly suitable for cutting holes in flat sheets or steel tubes. When glass-fibre reinforced plastic is cut, a special base is used which prevents glass-fibre dust blowing back and getting into the moving parts of the saw.

Pneumatic saws can be run for indefinite periods because there is no electric motor to overheat. There is a single lubrication point at the air inlet. As only 3 in. of hacksaw blade is required, there is a considerable saving in the cost of new saw blades.

High-quality finish on modern airframes for high-speed flight has brought about the need for new methods of assembly and the milling of rivet heads is an example of this. Armstrong Whitworths have developed a pneumatic hand milling tool for rivet heads which has a cutter designed to mill on flat or convex surfaces. It works at 5,700 r.p.m. and has micro-adjustment of the cutter which can be of ½-in., ⅝-in. or 13/16-in. diameter.

Hot Forming Press

ORIGINALLY developed by North American Aviation, Inc., a hot-forming and sizing press is now available from The Sheridan Machinery Co., Ltd., of Lincoln House, 296-302 High Holborn, London, W.C.1. The new press has been developed for the finish-forming and straightening of stainless steel and titanium, and for the forming of awkwardly shaped parts in other materials.

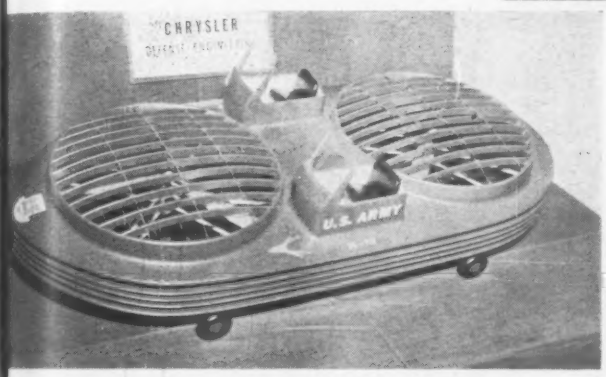
This type of press virtually eliminates all hand working, improves accuracy, removes residual stresses and increases the production rate. Wrinkles, buckling, "oil-canning" and other defects are automatically removed.

The basic functions of the machine are a combination of pressure, temperature and time. Electrically heated platens at top and bottom of the press give accurate temperature control up to 1,400° F. Pressure on the sides is supplied by hydraulic cylinders at front and back. With the lid closed, a vertical ram exerts top and bottom loading up to 300 short tons on the 3-ft.-square platen. The press is controlled from a push-button panel.

New World Photo-News

Pictures by Howard Levy

The Curtiss P-40N Warhawk (1,150-h.p. Allison V.1710 engine) seen above has been adapted for civilian use, with modified cockpit, and is used as a high-speed high-flying executive aircraft.



Above is shown a model of the Chrysler Aerial Jeep VTOL flat-riser aircraft, the prototype of which is being built for the U.S. Army. It is one of several ducted-fan designs being investigated.

Jerry Lawhorn, of Anchorage, Alaska, designed and built this single-seat Kee Bird, seen in the two pictures above, to perform well at height and operate from a 200-ft. patch of rough ground. It has a 190-h.p. Lycoming 0-435-1 engine, a span of 39-ft., and cruises at 110 m.p.h.

The three pictures on the right, from top to bottom, show the Model 10 (Lycoming 0-290-D2 piston engine driving centrifugal compressor) by Monte-Copters, Inc., of Seattle; the Model 10A making tie-down tests; and the Model 12, which is the Model 10 fitted with twin turbines and modified tail, with rudder aft of the exhaust outlet.

AN AUSTRALIAN AGRICULTURAL WORKHORSE

PRODUCTION of a promising new agricultural aircraft, representing a unique and praiseworthy approach to the problems of unit production costs, has begun at the Fisherman's Bend, Melbourne, plant of Australia's Commonwealth Aircraft Corporation.

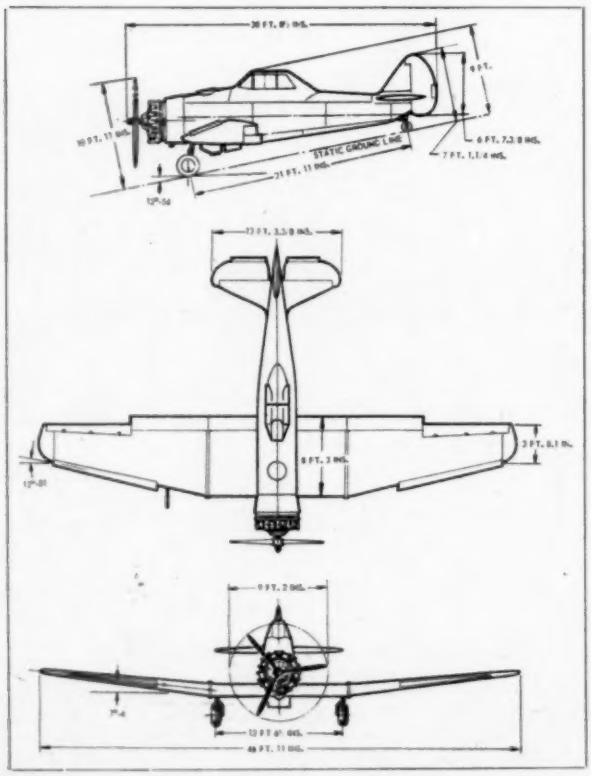
The aircraft is the 2,000-lb. payload C.A.C. Ceres—aptly named after the Roman goddess of the harvest. Two Ceres prototypes have been built, and the aircraft is expected to sell at about £A14,000. This has been made possible by designing the aircraft to a large extent around components—including the 600-h.p. Pratt & Whitney Wasp engine—of the wartime C.A.C. Wirraway, sister aircraft to the Harvard trainer.

Until Vampire Trainers were introduced for standard flying training a few months ago the Wirraway had been the R.A.A.F.'s advanced trainer since the War years. Large-scale disposals of Wirraways will be undertaken by the R.A.A.F., and the C.A.C. has made advance arrangements to ensure availability of enough surplus Wirraways to meet the requirements of the Ceres production programme.

The makers claim the low-wing, single-seat Ceres will be the best and safest agricultural aircraft in the World, and back their claim with impressive payload figures of 2,000 lb. of top-dressing material (2,360 lb. under overload conditions) and 250 gal. of insecticide. It is stated to be capable of top dressing 132 acres or spraying 380 acres in an hour, and can be used for fire-fighting and supply and materials dropping.

In past months the Ceres has been put through an exhaustive series of C. of A. trials by the Australian Department of Civil Aviation, and the first production aircraft is due to come off the line in March next. Initial production plans are for 40 aircraft at the rate of one every six weeks, to be expanded to 80 or 100—one a fortnight—depending on orders.

Like most aerial "workhorses," the Ceres is hardly a handsome aircraft. In some respects it retains the characteristic lines of the Wirraway, but has grown in several directions.



Normal gross weight is 6,640 lb. and service load 2,520 lb. Wing area, with large slotted flaps and fixed slats on the outer half of the leading edges, is 312 sq. ft., giving a loading of 21.2 lb./sq. ft.

The undercarriage is fixed, and there is a complete absence of electrical and hydraulic gear, with obvious cost and maintenance advantages. Flaps are wound up and down by the pilot, but this presents little inconvenience as the top-dressing flap position is expected to be normally half-down (10-12°) and would almost invariably be set before take-off. This being the case, the only in-flight flap movement necessary would be to "full down" for landing. The supercharged Wasp powerplant will maintain sea-level power to 3,000 ft. and static thrust has been increased 30% by reverting to direct propeller drive.

Power loading is 11.1 lb./h.p. Payload is carried in a 40-cu.-ft. stainless-steel hopper, loaded by way of a round-hinged filler door ahead of the windshield and operated by a knob on the instrument panel. Change from solid load to liquid is stated to be simple, requiring only fitting of pump gear, filter and valve.

The rate of application can be varied from 1 to 5 cwt. an acre or up to 120 gal./min., large wing area and flaps being claimed materially to assist penetration into foliage over swathe width of 60 ft.

Fuel tankage is 80 gal. in two wing tanks, half only being used during operations giving an endurance of 2¼ hr. based on 6-min. circuits.

On the performance side, with 2,000-lb. load, the Ceres takes off and clears a 20-ft. obstacle in 370 yd., climbs at 800 ft./min. and top dresses at 80 knots. With full flap, loaded sea-level stalling speed is 58 knots; empty sea-level stalling speed, 47 knots, and landing empty at 4,500 lb. is accomplished in a minimum of 190 yd., or 390 yd. over a 50-ft. obstacle. At a ferry weight of 4,950 lb., the Ceres cruises at 90 knots, has an initial rate of climb of 1,200 ft./min., and an absolute range of 450 nautical miles with full 80-gal. tankage.

According to test pilot Roy Green, the aircraft shows first-class response to controls and outstanding stability in all conditions. The 80-knot operating speed permits reasonable turns with adequate margin over the stall. In the stall itself there is no wing-dropping tendency and positive aileron control is maintained throughout. Stall warning judder begins 7 to 10 knots above the stall and with power off and stick hard back the Ceres pitches gently fore and aft in and out of the stalled condition.

Green says that with power on and stick hard back, the stall takes the form of a controlled and continued "squash." Power on and off, recovery is immediate when the stick is moved forward. To add to what seems a remarkable safety picture, the aircraft merely "squashes" in stalled turns and shows no tendency to "tuck in."

Pilot visibility, which can be tested by anyone who has sat in the comfortable cockpit, is excellent, full forward view being available with the tailwheel on the ground. Radio gear will be provided by the C.A.C. as an optional extra, and full stocks of spares and after-sales service will be available at the Fisherman's Bend plant.

Main figures behind the Ceres concept are the C.A.C. manager (Sir Lawrence Wackett), chief engineer Ian Ring and chief design engineer J. A. Kentwell. The Ceres project represents a determined effort by C.A.C. leaders to maintain productive capacity in face of a scarcity of orders for Avon Sabres now in production or other military projects. The decision to go ahead with development and production of the Ceres was made only after close study of the market.—L.H.Y.

PRIVATE FLYING

H.J.C.'s Club Commentary:

A Club at Flers

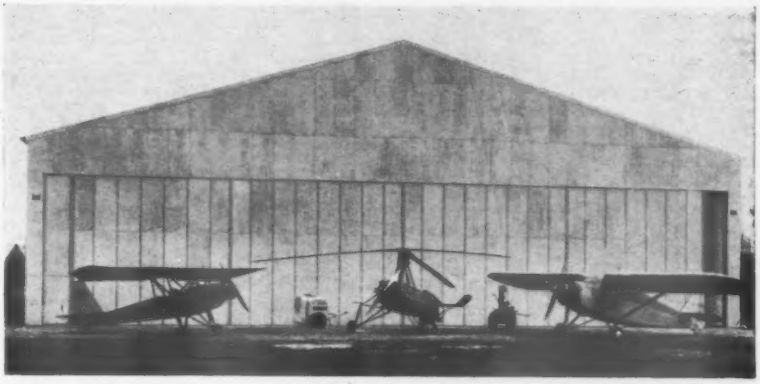
Displays and Meetings Australian Anxiety

● FATHER AMIARD, well known as the host at the Flers air rallies in Basse-Normandie, has sent us some details about the origin of his club.

It came into being on November 11, 1934, and as no aeroplane was then available members had to confine their activities to aero-modelling. Many gliders and both petrol-driven and rubber-driven models were flown in inter-club competitions.

By 1936 the club had grown up to the extent of owning three actual aircraft: a 60-h.p. Potez 60 two-seat parasol monoplane, a Caudron Phalene and an Autogiro. The first instructor was M. Henri Goussin, a test pilot based near Paris, who used to give his services part-time to the club.

The town of Flers, with a population of 14,000, gave good support to the club, and in the first two years some 2,000 hr. were flown without accident.



IN THE BEGINNING.—The fleet of the Aero Club at Flers in 1936. Left to right, the Potez 60, F-ANOB; the Cierva C-30A, and the four-seat Caudron Phalene, F-AMMO.

● A LITTLE later, with the help of the Society of Model Aeronautical Engineers in London, the club began organizing the Anglo-French rallies primarily for modellers, and laid down the beginnings of what has proved a particularly pleasant and lasting friendship.

When the War came in 1939 it was, of course, inevitable that flying stopped, so members again reverted to making model aircraft.

In 1942 Henri Goussin was killed in action, and in his memory the club was thereafter known as the Aéro-Club Henri Goussin.

During the War much damage was done to the aerodrome, but immediately afterwards Father Amiard again got in touch with the S.M.A.E. and more meetings were held at Flers. The British participants unfortunately found it expensive to visit Flers, so the form of the rallies was modified and private pilots from Britain were invited to attend. Members from the Herts and Essex, Elstree, Denham and Surrey clubs have formed the greater part of the guests, while aircraft have also flown in to Flers from North Africa, Belgium, Denmark and Spain.

Each year popularity has increased, and on the last occasion some 65 aircraft were present.

● AFTER the War restoration work included the rebuilding of the hangar, and some help was given by the F.A.U.F. (Fédération Aéronautique de l'Union Française), whose general secretary, M. Harel, is president of Father Amiard's club.

From organizing rallies Father Amiard turned his attention some time ago to manufacture, and with two members, former modellers, he has built a Jodel. It was successfully flown by M. Renaudin, and is giving good service.

This year's Flers rally had unfortunately to be cancelled, after much effort had been made towards organizing it, but this is not the end and the many British and other pilots who have been entertained at Flers look forward to a rally next year.

● PERFECT WEATHER favoured the **Fair Oaks Aero Club** for its air display on July 19, and the public turned up in force to watch.

The show started with a demonstration by the Automobile Association's Rapide of air/ground liaison, then three members of the Tiger Club flew round in formation, the aircraft tied together with red ribbons. A scarlet and cream sailplane gave a graceful display of aerobatics.

Norman Jones then led four Tigers and an Auster aloft with six members of the British Parachute Club, their delayed descent followed by an aerobatic show by C. A. Nepean Bishop in his special Tiger, G-APDZ.

A crazy-flying item followed (with the club's C.F.I., Wg. Cdr. C. Arthur, disguised as an oriental pupil), and then four Hunters of No. 56 Squadron, led by Sqn. Ldr. R. J. S. Dickinson, arrived and made some very smooth changes of formation from line astern to box, to echelon and bomb-burst.

An impressive finale was provided by Jeffrey Quill's nostalgic display in a Spitfire 5.

● IN CONJUNCTION with Navy Week, the **Plymouth Aero Club** is holding a three-day meeting at Plymouth Airport, Roborough. Features will include an arrival competition (between 12.00 and 13.00 hrs. on August 2); a *concours d'élégance*, for which the Roborough Trophy will be awarded; a conducted tour of the R.N. Dockyard, Devonport, on the afternoon of August 2, with, in the evening, a reception and barbecue at the clubhouse.

Club and visiting aircraft will make a 30-min. tour of the district on Sunday morning, August 3, followed by lunch in the clubhouse; and in the afternoon some of the

For the Home-builder

RAY STITS, of Riverside, Calif., has recently added another light aircraft to his range of designs for home construction. This is the Model SA-7B, called the Sky Coupe, which is a two-seater with side-by-side enclosed accommodation.

The fuselage is of chrome-molybdenum steel tubing with fabric covering; the wings are of wood and are fabric covered. A 65-h.p. Continental engine is fitted, and there is a 20 U.S. gal. fuel tank.

This aircraft is not available in kit form, but plans may be purchased.

PERFORMANCE.—Maximum speed, 115 m.p.h.; cruising speed, 100 m.p.h.; cruising range, 450 miles with normal tankage.

WEIGHT.—Empty, 649 lb.

DIMENSIONS.—Span, 26 ft. 8 in.; length, 17 ft. 9 in.; height, 6 ft. 2 in.

Levy-Enich photograph

beauty spots of Dartmoor will be visited by coach.

The rally ends on the morning of August 4, but for those who stay on a cocktail party and dance are to be held in the evening.

Members of British aero clubs and friends from overseas are invited. The entry fee is £2 10s. per person, plus, of course, hotel accommodation and other personal charges.

● OUR Australian correspondent, L. H. Yardley, writes:

Official concern over the structural condition of composite-wood aircraft operating in Australia is reflected in a revised policy by the Department of Civil Aviation which will gradually eliminate them from the register.

The new policy amounts to a ban on the importation of aircraft with stressed wooden shell structures or wooden box spars, and will involve owners of such aircraft already registered in a considerable increase in C. of A. costs.

Types affected include the Leopard Moth, Moth Minor, Gull, Proctor, Wackett Trainer, all Miles types, B.A. Eagles and Swallows.

Aircraft concerned which are already registered privately, or unregistered, will not be approved for re-registration in a commercial category.

The only aircraft, it seems, which will escape the effect of the policy are the ultra-lights, which will be checked for structural integrity by proof-loading with sandbags.

This "death sentence" follows the earlier D.C.A. move which gave aircraft surveyors the right to put suspect aircraft to a much more comprehensive test than previously required for C. of A. renewals.

● AT WESTON aerodrome, Leixlip, Co. Kildare, on August 3 and 4, the **Leinster Aero Club** is to hold its fourth annual air display. The honorary secretary of the club, Mr. E. G. Verso, writes that British private pilots are welcome. The aerodrome is 7½ miles west of Nelson Pillar, Dublin; the telephone number is Lucan 435.

Club and privately owned aircraft at Leinster include four Chipmunks, four Tiger Moths, three Swallows, a Proctor, an Autocrat and a Messenger.

Photograph copyright "The Aeroplane"

"WEARING DADDY'S HAT."—Sqn. Ldr. D. B. de Sarigny, C.F.I. of the North London Aero Club at Panshanger, wears the helmet his father used in the First World War.

GLIDING NOTES

SINCE "Airmet" ceased to broadcast its special forecast for glider pilots at 08.25 hrs. every day of the week, nearly a decade ago, the only way to get similar forecasts has been for individuals to telephone the nearest met. station. Some day, perhaps, pilots who dial "GLI" will hear a tape-recorded forecast of thermals, clouds, winds and waves.

Meanwhile, a regular service of forecasts for glider pilots has been laid on by the South German broadcasting corporation, *Flugwelt* relates. They are produced by the met. station at Stuttgart, and are given out at 09.00 hrs. on Saturdays and 08.00 hrs. on Sundays and public holidays (note the subtle difference in time). If the weather is unusually good for long-distance soaring, a special forecast is given after the news, apparently on any day of the week.

* * *

Another novelty described by *Flugwelt* is a *Vergleichsfliegen* contest, held on Celle gliding ground. Normally this word implies a test of comparative performance between different machines, rather than pilots, and it was indeed a motley collection of types that assembled from five neighbouring gliding clubs for three days at the end of May.

There was a Ka-6BR, the machine which later won the OSTIV prize at Leszno for the best Standard Class entry, a K-2, a Weihe, a Fauvel AV-36 flying wing, three of the L-Spatz type of which two were Mk. 55s and a couple of two-seaters—Bergfalke II and Ka-7. So spans ranged from 12 to 18 metres. But two-seaters had a bonus of 15%, and further to complicate the comparative figures was a bonus of 10% if two different pilots took turns on the same machine; this was to encourage more people to fly.

* * *

Leading results were: Celle's L-Spatz-55 and Weihe, each flown by two pilots, 1,320 and 1,127 points respectively; Burgdorf's Bergfalke, 867; and Hanover's Ka-6BR, 695. To make a real test between different types, one needs first-class pilots and excellent thermals; but neither of these conditions was satisfied on this occasion. Only one pilot completed the first task, a 101-km. dog-leg flight to Hamburg; three managed the second, a short out-and-return in poor weather; and nobody finished the third, a 101-km. out-and-return.

* * *

A STORY comes from Austria of a woman pilot from Linz, Maria Derndl, descending in "a small glider" into "a raging Alpine torrent." The glider floated upside-down with its pilot submerged, being strapped in, but was seized and righted by some workmen on the banks of the Gollingsbach, who pulled out the unconscious pilot and revived her.

Another Alpine gliding story, which was rather less credible but nevertheless appeared in the Press about 25 years ago, was of a pilot who was lost in cloud when a house on a mountain-side suddenly loomed in sight. A few seconds later he had alighted on its roof—only to find that it was his own house.

While searching for this item in the *Sailplane and Glider* for 1933 I came across another Alpine piece. In Switzerland, even nowadays, there are some awkward regulations about limits to the size of trailers allowed on the roads. But in 1933, all transport of aircraft by motor-car was forbidden there, so a Spyr sailplane was brought to a Zürich exhibition in a trailer pulled by a cow.

* * *

WRITERS on aeronautical history will never succeed in collecting every incident in which a member of the human species has fitted artificial wings to himself and tried to fly. A writer in the *Shetland News* has brought another one to light. Over a hundred years ago, one Andrew Peterson, alias Andrew Kantle, "decided that he would glide Ingamoor Houll to Cruel Houll, two small knowles with steep sides situated on the croft of Ingamoor. For wings and tail he stretched and dried on hoops three sheepskins. Attached to this he attempted to take off from Ingamoor Houll but he didn't glide—he fell on to a cairn and was badly hurt." He explained afterwards that he "could not get his tail to work."

* * *

A RULING by the Gliding Federation of Australia, establishing a lower limit of 15 years for pilots flying solo in gliders, has not met with the approval of the South Australian Gliding Association, particularly the Waikerie Gliding Club. Kevin Gillespie, of that club wrote to *Australian Gliding* describing a flight by Ronald Brock, aged 12, who reached 8,500 ft. during a 4-hr. solo flight in a Grunau 4, and the next day was up for 45 min. in "very rough frontal conditions." The club had 12 pupils, including 10 juniors, in the pre-solo stage when the age limit was announced with much publicity; as a result, the juniors were all withdrawn by their parents, leaving just the two adults.

Gillespie adds that children of nine and 10 years can be seen driving retrieving cars on the airfield and "carrying much of the responsibility for seeing that flying is kept going.... All this," he says, "is fine groundwork for the responsibility they later carry when they fly solo." As against this, *Australian Gliding* points out that people under 15 are not prevented from flying; they are only prevented from doing it solo.

In England, before the War, John Aspell, son of the Oxford Club's secretary, took his "A" at the age of 10, and two sons of members of the Derbyshire and Lancashire Club were "C" pilots at 14; so was Mick Kaye, son of a founder-member of the club, more recently. All were reliable pilots, probably because they were already soaked in gliding lore when they began training. The present British age limit of 16 was imposed after persistent agitation by a non-gliding Member of Parliament.

What I would like to know is: supposing several people aged 35 hurt themselves gliding, should the authorities impose an upper age limit of 34 or a lower age limit of 36?

* * *

ON the occasion of Poland's National Liberation Day, July 22, H.E. the Polish Ambassador gave a cocktail party to many hundreds of people including several Members of Parliament. Having been honoured with an invitation, the writer assumed it was in respect of his having accompanied the British team to Poland for the World Gliding Championships. However, as no other members of the British party were there, one must conclude that the honour was in recognition of the publicity given to gliding activities in Poland in *Sailplane and Gliding* and in THE AEROPLANE.—

A. E. SLATER.

CORRESPONDENCE

Lockheed Aerobatics

THE Bishop-Tiger Moth G-APDZ which, as you say in your article on page 115 of the July 18 issue, was produced as an attempt within the restrictions of very limited private finance to give our British pilots some opportunity of putting up an aerobatic show to compete with the Continental experts, has, I admit, its limitations. Although it is quite capable of doing flick-rolls, and has done them unofficially, unfortunately our friends at the A.R.B. apparently do not approve of such things in a Tiger Moth, although I well remember that we used to do them in the old Cirrus Moth many years ago, and, as you say, Leon Biancotto, who had never flown the machine before until that moment, showed us at Coventry what could be done with it.

The real trouble is, as you say, that the British pilot needs more practice. Some time ago I appealed to some patriotic owner of an aerodrome near London to allow us to use it for practice purposes. You must practise over an aerodrome, using some fixed point to simulate the judges' stand. We have had no response, and I make just one more appeal to owners of aerodromes to allow us to undertake comparatively low aerobatics without having to go to the cost out of our own pockets of flying to some distant place far from the London Control Zone.

NORMAN JONES
(Chairman, The Tiger Club).

Claygate, Surrey.

British Tricycles—I

YOUR correspondent Mr. Ayers (THE AEROPLANE, July 18) is indeed unfair in his comments on tricycle undercarriages.

In addition to the two examples on which you correct him, what about the following: Miles X Minor (Scale model of Brabazon project) designed, built and flown in 1941; Bristol Brabazon and Miles Marathon, designed in 1943; Miles Aerovan designed and built in 1944; Armstrong Whitworth Apollo, Handley Page Hermes IV and V designed in 1945; Bristol Britannia and Miles Merchantman designed 1946.

Nor is there any need to turn to American Service types. What about the Gloster/Whittle of 1939, the Meteor of 1940, the Vampire of 1941, the Miles Libellula of 1942, the supersonic M.52 of 1943, the D.H. 108 of 1945, the Sea Hawk and Valiant of 1946?

All the above designs had tricycle undercarriages.

Farnborough, Hants. D. L. BROWN.

British Tricycles—II

WITH some trepidation I query the editorial comment to my letter in the issue of July 18. The Viscount and Elizabethan were certainly tricycle types formulated before 1950, but an international airport such as London cannot be designed without considering all types of aircraft using it.

Whilst B.O.A.C. were seriously considering the Tudor and B.E.A. using the Viking, London Airport may have needed three runway directions. The machinery which runs and co-ordinates aviation policy in this country (if any) was creaking badly until about 1950 as the "penny had failed to drop" regarding the merit of the tricycle undercarriage, and its influence upon aircraft and airport design.

Woodford Green, Essex. R. H. AYERS.

Re No. 46 Squadron Reunions

MAY I please be permitted through your columns to explain to Sqn. Ldr. A. H. Curtis that the reason why (apart from its *esprit de corps*) "46" has been enabled to hold its 41st reunion is because the first dinner was held in February, 1918, to celebrate the marriage of its C.O. then Major—now Air Marshal Sir Philip Babington (Retd.). To the best of my recollection at no time has the number attending these functions fallen below 25 (even during the last War) and that on many occasions the C.O. and officers of the serving squadron were present. For many years the dinner was followed next day by a luncheon at which members and their ladies attended.

Doubtless it will be remembered that the Squadron made history by being the first to fly their Hurricanes "off" and "on" an aircraft carrier and the Squadron was lost at the tragic sinking of H.M.S. "Glorious" after the battle of Narvik.

It is to be regretted that Sqn. Ldr. Curtis found it necessary to use the expression "after attending to the War first" in his allusions to the reunion of 49 Squadron—a remark so contrary to the spirit of the old R.F.C.

The achievements of "46" will compare very favourably to any other squadron in the Service, notwithstanding those of "49" and it is still an indisputable fact that since 1918 there have been 41 dinners attended by officers, either past or present, of "46" Squadron.

Woburn Sands, Bucks. CECIL J. MARCHANT.

Roundabout

Vital Viscount Statistic. A rather staggering fact, which does nicely to round off the Viscount's tenth birthday celebrations, has been worked out before my very eyes by Basil Stephenson, Vickers' Chief Engineer, Civil Aircraft. The company's Civil Aircraft Development Group has also come to the same impressive conclusion. Here it is: At mid-1958 rates of utilization A VISCOUNT TAKES OFF OR LANDS EVERY 32 SECONDS.

*

Over the Waves. Senior Naval officers are noted for the pithy and unrestrained signals they make at sea. Here's an airborne one worthy of record. An F.O.F.T. (Flag Officer, Flying Training), the story goes, identified himself to Air Traffic Control as "Foxtrot Orange Foxtrot Tango." "Who?" they asked. "Foxtrot Orange Foxtrot Tango," repeated the distinguished pilot. Again, "Sorry—what do you say?" "Oh, hell!" came the reply, "call me 'Dancing Boy'!"

*

P for Phew! Then there's the one about the R.A.F. pilot who likewise didn't take kindly to the changed alphabet. After several abortive attempts to make himself understood, he howled, "Listen, you lot, N for neumonia, U for Urope, T for tomaine, S for sigarette."

*

Philatelling the World. From Australia comes a letter bearing a stamp showing a Qantas Constellation, the World and the words "Encircling the Earth," a blatant advertisement for that airline's Round-the-World service. A French stamp has a charming

picture of a chateau. Why doesn't this old country brighten up and similarly do right by its airlines and tourism? What would look nicer than, say, an issue of coloured airliner caricatures? Don't tell me.

*

Ship-Shape, Anyhow. The above Britannia touch reminds me of what is surely the final Bristol Freighter joke. An American motorist saw his first Freighter at Ferryfield and asked an A.A. man what it was. "It's a Bristol," was the reply. Said the American, "*That's* a 'Whispering Giant'?"

by Gordon

NOTES AND EVENTS

INDEPENDENT ACTION.—This baggage loader, designed by Skyways, Ltd., to an original conception and built by Samlesbury Engineering, Ltd., has electrically driven rear wheels, and an electrically driven conveyor belt is raised and lowered by hydraulic pressure. Power is derived from a 600-c.c. twin-cylinder petrol engine.

NOTES ON NOISE.—A very useful little booklet has been produced by Amplivox, Ltd., of 2 Bentinck St., London, W.1, entitled "Noise in Industry." It is full of facts and figures on this important subject and is worthy of study by all those concerned with sound and sound suppression.

TITANIUM INFORMATION.—William Jessop and Sons, Ltd., of Sheffield, has published a new information sheet (No. M811) dealing with the corrosion - resisting characteristics of titanium alloys. The data in the leaflet is primarily compiled from laboratory tests on commercially pure titanium Jessop qualities Hylite 10 and 15.

CHEMICAL RESEARCH. — The Council for Scientific and Industrial Research has approved changes in the functions of the Chemical Research Laboratory and changed its name to the National Chemical Laboratory. In future the Laboratory will concentrate its effort on a few objectives, so that it can make a real impact on selected problems of national importance.

VANGUARD LIGHTING. — The General Electric Co., Ltd., in conjunction with Vickers-Armstrongs (Aircraft), Ltd., has developed a transistor-oscillator inverter unit which allows, for the first time in this country, fluorescent lighting to be used in transport aircraft. The first application of these units in conjunction with fluorescent lighting will be in the Vanguard, which will have 4 ft. and 3 ft. Osram tubes for the main cabin lighting.

AIRCRAFT ALLOYS.—The Titanium Division of the Crucible Steel Co. of America has recently announced the development of three new titanium alloys. All of the solution heat-treated and aged type, the new alloys are now in limited production in a number of forms. Details can be obtained in the U.K. from Henry Gardner and Co., Ltd., 2 Metal Exchange Buildings, Leadenhall Avenue, London, E.C.3.

PLESSEY APPRENTICES.—A new apprentice training school attached to the Plessey Co., Ltd., at Swindon, was officially opened on July 10. Completely self-contained, the building is equipped with a lecture room, drawing office and machine shop.

SUPERSTON ALLOYS.—J. Stone and Co. (Charlton), Ltd., of Charlton, London, S.E.7, has produced a new series of pamphlets and technical information sheets on the Superston range of corrosion-resisting alloys.

CHEMICAL EXTINGUISHER. — Foamite, Ltd., of Plymouth, has developed a 150-lb. dry chemical fire extinguisher. Mounted on a steel chassis with disc wheels, the extinguisher has a flat-fan discharge of 150-lb. of powder in one minute.

K. AND H. MOVE.—Kelvin and Hughes (Industrial), Ltd., will move their administrative offices from 2 Caxton Street, Westminster, London, S.W.1, to new premises at Empire Way, Wembley, Middx, by August 11. The new telephone number is Wembley 8888.

MATERIAL SUPPLIER.—The aeronautical engineers, Aircraft Materials, Ltd., of Midland Road, London, N.W.1, were inadvertently not included in the list of suppliers of basic materials and associated equipment in THE AEROPLANE Materials and Processes special issue of June 20.

BIRTH NOTICES

Bragg.—On July 17, at Sutton-on-Sea, to Olga (*née* Hanson), wife of Flt. Lt. R. H. Bragg—a daughter.

Dollimore.—On July 15, at R.A.F., Henlow, to Pamela (*née* Wood), wife of Flt. Lt. R. P. Dollimore—a son.

Newman.—On July 17, at Kuala Lumpur, to Daphne (*née* Ross), wife of Sqn. Ldr. A. T. Newman—a son.

Northam.—On July 19, at Woolwich Military Hospital, to Iris, wife of Plt. Off. V. J. Northam—a daughter.

Stanley.—On July 15, at B.M.H., Nicosia, to Bunty (*née* Savage), wife of Flt. Lt. B. H. Stanley, D.F.C.—a daughter.

Tucker.—On July 20, at R.A.F. Hospital, Ely, to Susan (*née* Ing), wife of Flt. Lt. J. R. Tucker—a son.

Upton.—On July 17, at Louise Margaret Hospital, Aldershot, to Margaret (*née* Methuen), wife of Sqn. Ldr. J. D. Upton—twin sons.

Aviation Calendar

August 1-16.—World Parachute Championships organized by the Czech Aero Club at **Bratislava,** Czechoslovakia.

August 2. — R.N.A.S. **Brawdy** "At Home."

August 2-4. — Navy Week Air Rally organized by the Plymouth Aero Club, at **Plymouth Airport.**

August 3-4.—Leinster Aero Club air display at **Weston Aerodrome,** Leixlip, Co. Kildare.

August 10.—Tea Patrol organized by Elstree Flying Club at **Elstree Aerodrome,** (15.45—16.15 hrs.)

August 10.—Visit of NATO air cadets to Surrey Flying Club, **Croydon.**

August 16-17.—Second Wines-of-Alsace rally organized by the Aéro-Club Centre, **Alsace,** France.

August 18.—International Military Aeronautical Pentathlon, at **Ostend,** Belgium.

August 31.—Oxford Aeroplane Club "At Home," at **Kidlington Airport,** Oxford.

September 1-7. — S.B.A.C. Display and Exhibition, at **Farnborough.**

September 4-6.—AGARD Avionics Panel Meeting, at **Cambridge University.**

September 8 - 13. — First International Congress of the Aeronautical Sciences, **Madrid.**

September 12-22. — Aeronautical Pentathlon and Air Rally at **Liège,** Belgium.

September 15-21. — Battle of Britain Week.

September 21.—Sailplane aerobatic competition organized by the London Gliding Club, at **Dunstable,** Beds.

September 21.—Air Rally organized by the Milan Aero Club, at **Milan.**

September 21.—Royal Belgian Aero Club international concourse for balloons, **Brussels.**

September 26-29.—Austrian Aero Club Rally at **Innsbruck.**

Company Notices

NEW COMPANIES

Balfour Electronics, Ltd. (607,849).—Private co. Reg. July 11. Cap. £1,000 in £1 shs. Directors: Bernard Smith, New York, U.S.A.; Samuel E. Norman, Manor House, Manor Road, Chigwell, Essex, director of Balfour Marine Engineering Co., Ltd., etc.; Leslie E. Norman, Coopersale Hall, Epping, Essex, director of Balfour Aviation, Ltd., etc.; Cecil H. Jones, director of Automatic Musical Instruments (G.B.), Ltd., etc. Sec.: F. W. Peak. Reg. off.: 2 Station Rd., Ilford, Essex.

Crop Culture (Overseas), Ltd. (607,851).—Private co. Reg. July 11. Cap. £100 in £1 shs. Objects: To carry on business in territories outside the United Kingdom as crop sprayers by aerial and other methods, and as spreaders of lime, marl, manures, etc. Permanent directors: Frank H. J. Mann, Ilsham Rise, Marine Drive, Torquay, wholesale fruit merchant; Nigel D. Norman, Elm House, Bembridge, I.o.W., engineer; Forester R. J. Britten, St. Denis, Bembridge, I.o.W., engineer; James M. McMahon, Stapleford Aerodrome, nr. Romford, Essex, commercial pilot. Solrs.: Beaumont and Son, 380 Gresham House, Old Broad St., London, E.C.2.

Harrington, E. W., Ltd. (607,567).—Private co. Reg. July 7. Cap. £10,000 in £1 shs. Objects: To carry on the business of designers, manufacturers of and dealers in aircraft and aircraft accessories of all kinds and automobiles, etc. Directors: Ernest W. Harrington (permanent chairman and governing director) and Mrs. Lucy F. Harrington, both of 187 Winchester Avenue, London, N.W.9. Sec.: A. A. Strudwick. Reg. off.: 187 Winchester Avenue, London, N.W.9.

Independent Air Brokers, Ltd. (607,878).—Private co. Reg. July 11. Cap. £1,000 in £1 shs. Objects: To carry on the business of air and ship brokers, charterers, loading brokers, etc. Subscribers (each with one sh.): Rosemary A. R. Goode, 38 Roland Gardens, London, S.W.7, secretary; Henry A. Corsellis, 84 Piccadilly, London, W.1, company secretary. First directors to be appointed by subscribers. Sec.: H. A. Corsellis. Reg. off.: 84 Piccadilly, London, W.1.

CHANGE OF NAME

Barton Moss Engineering Co., Ltd. (523,645), 48 Brook St., Oldham, Lancs. Name changed to Barton Moss Engineering Co. (Aircraft), Ltd., on May 30, 1958.

New Patents

APPLICATIONS ACCEPTED

801,110.—Sud-Aviation, Soc. Nationale de Constructions Aéronautiques, formerly Soc. Nationale de Constructions Aéronautiques du Sud-Ouest.—"Device for bringing loads carried by an aircraft into position for dropping."—June 11, 1956 (June 13, 1955).

801,080.—Hobson, H. M., Ltd., Westbury, Wilts., and Glaze, S. G.—"Power-operated aircraft flying control systems."—Nov. 6, 1956 (Nov. 9, 1955).

Applications open to public inspection on Sept. 10, 1958; opposition period expires on Dec. 10, 1958.